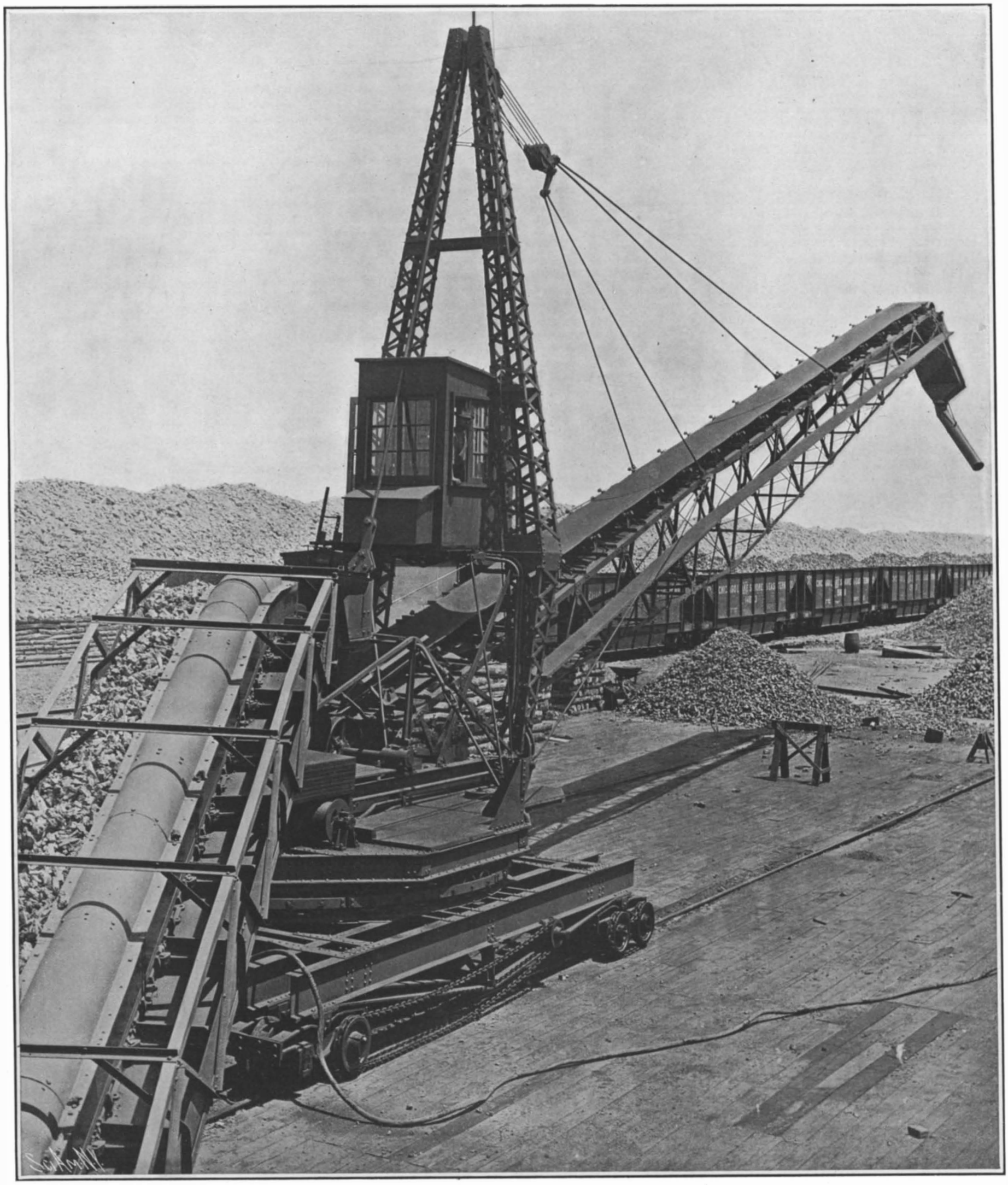
SCIENTIFIC AMERICAN

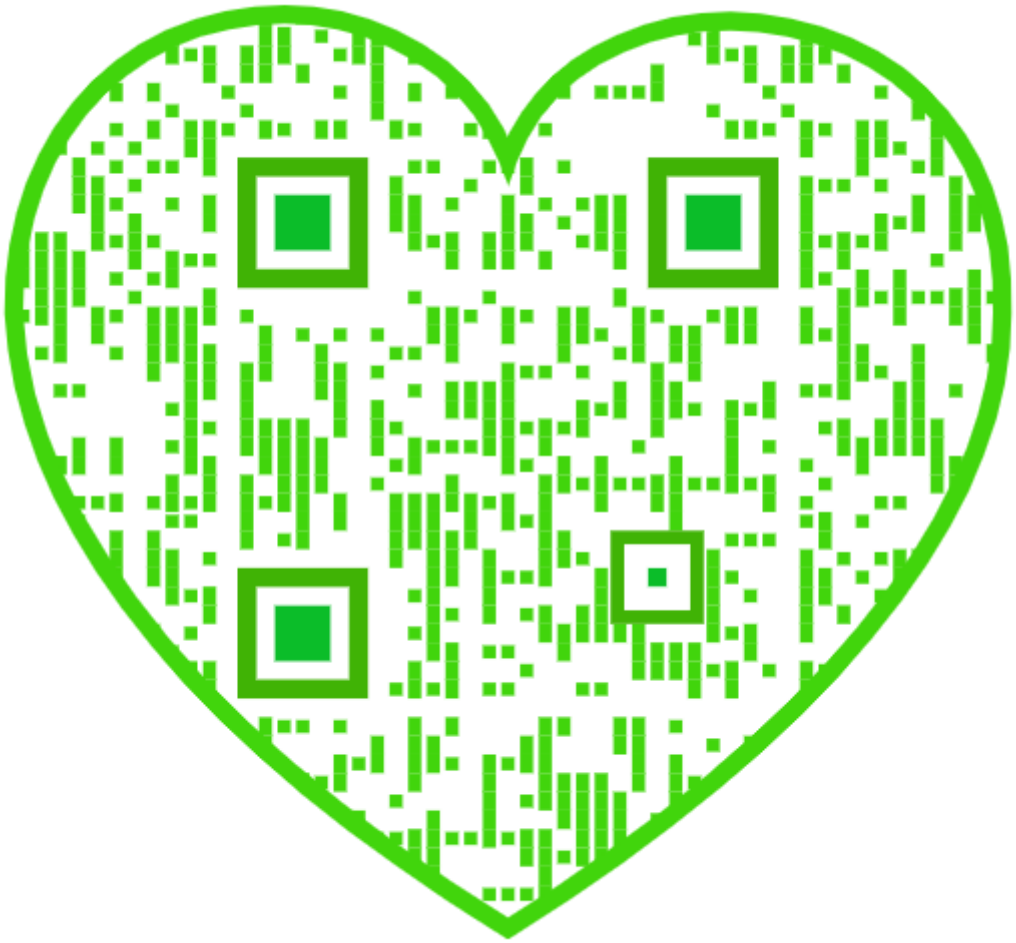
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1908, by Munn & Co.]

Vol. XCIX.—No. 3. ESTABLISHED 1845. | NEW YORK, JULY 18, 1908. | 10 CENTS A COPY $3.00 A YEAR.



The Machine Takes the Coke from the Face of the Pile and Delivers It Without Breaking the Fuel.

A MACHINE FOR HANDLING COKE IN THE YARD.—[See page 40.]



SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845) ..... $3.00 a year
Scientific American Supplement (established 1876) ..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JULY 18, 1908.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE SCIENTIFIC AMERICAN AERONAUTICAL TROPHY.

Elsewhere in the present issue will be found an account of the recent competition for the SCIENTIFIC AMERICAN aeronautical trophy. The successful flight made by Mr. Glenn H. Curtiss was the culmination of carefully planned and patiently and intelligently carried out efforts for the winning of this trophy, by a combination of inventors known as the Aerial Experiment Association. Its moving spirit and principal backer is Dr. Graham Bell, whose elaborate experiments in aeronautics, carried on for the past few years on his private estate, are well known in the aeronautical world. Not without the inventor's due share of discouragement, and not until the expenditure had been made of much time and money, was the machine which achieved success finally produced; for this was the third aeroplane built by the association, the first two having failed to give altogether satisfactory results; although sufficient was achieved in the earlier trials to give confidence that the present machine would be equal to the terms of the competition.

The success of Mr. Curtiss and his associates has already awakened widespread interest, and has led to the construction of several new aeroplanes, which, if all goes well, will be entered in the next contest for the trophy. This will probably take place about the middle of September next. Now that another successful aeroplane besides that of the Wright brothers has been developed in this country, and in view of the rapid progress which is being made in aeronautics, the Contest Committee of the Aero Club has decided that the rules governing the competition should be sufficiently stiffened to insure that the winning machine will represent the top notch in the present-day science and art of mechanical flight. It is probable that the prime requisites called for under the new rules will be high speed and automatic stability.

THE FIRST 25-KNOT LINER.

The "Lusitania," by making her last passage from Queenstown to New York in 4 days, 19 hours, and 36 minutes at an average speed of 25.01 knots, has the distinction of being the first 25-knot transatlantic liner. On her first day out she made a record run of 643 knots, at an average speed of 25.38 knots. It has taken twenty years to raise the speed from 20 to 25 knots; and the question naturally arises as to how many years of development will be necessary to reach the 30-knot mark. One thing is certain: that unless our naval architects can find some form of propeller that will show a much higher efficiency than the best of those now in use, the 30-knot liner must be driven by some other form of motor than the steam turbine. It will be a far greater task to raise the speed from 25 to 30 knots than it was to raise it from 20 to 25 knots. The resistance of a ship at these high speeds increases approximately as the cube of the speed. The cubes of 25 and 30 are respectively 15,625 and 27,000; and since it takes 70,000 horse-power to drive the "Lusitania" at 25 knots, it follows that 121,000 horse-power must be put into the ship to drive her at 30 knots. Now her present engines and boilers already occupy 450 feet of her length; and the doubling of her motive plant is evidently impossible. Future ships will of course be longer; but he would be a bold architect who would undertake to guarantee 30 knots, even in a 1,000-foot vessel. If it were possible to get 80 per cent propeller efficiency, it might be done, but not otherwise.

AERONAUTICS IN WAR—A REDUCTIO AD ABSURDUM.

Although it has become a truism that the aeroplane, and in a less degree the airship, will find their most useful sphere in the field of military scouting, few people seem to have realized what a revolutionary effect the new means of locomotion will have. We confess to a sincere dislike for that term "revolutionary" as ordinarily used, but here, for once, it can be truthfully applied; for if the airship can only fulfill its present promise, the time is not far distant when the art of war, as practised to-day, will be stripped of its most important element of success, and its prosecution, at least along modern lines, will be rendered well-nigh impossible.

The strategy of ancient and medieval times was simple compared with the complexity introduced by the invention of gunpowder and the present-day development of offensive weapons, the smallest of which, as carried by the individual soldier, is fatal at a distance of a mile and a half. The futility of frontal attacks made by massed bodies of troops; the necessity for bringing bodies of men into action only over ground where more or less cover is available; the decisive part played by the natural topography of the field of battle in determining the issues of the day, have given to strategy and tactics, but particularly to the former, an importance far greater than they held in ancient or medieval times, or even in the wars of the nineteenth century. And successful strategy is possible only when the movement of troops and their various dispositions can be clouded under a veil of close secrecy. Secrecy is, indeed, the very soul of strategy, and without it strategy becomes worse than useless, and merely a waste of time and energy. Should secrecy for some reason become impossible, war would revert to the methods of earlier times, and the outcome of battles would depend upon superior weight and numbers. Napoleon's famous dictum that God is on the side of the big battalions would again hold true.

Now there can be no question that the world to-day is in possession, or very soon will be, of a system of scouting which will destroy at once that very secrecy which is essential to successful strategy. Only a few weeks ago, as recorded by themselves in this journal, the Wright brothers were sweeping over the sand dunes on the coast of northern North Carolina in a machine which was perfectly under control, at a speed of from 38 to 42 miles an hour. These aeronauts are satisfied that the principles of the art, both theoretical and constructional, are now so well understood that it is possible to build an aeroplane that will carry a couple of men for hours at a time at a speed of from 50 to 60 miles an hour. Moreover, only a few days ago Count Zeppelin, in his Brobdingnagian steel and aluminium airship, proved that it is possible to remain in the air all day, and maneuver at speeds of over 30 miles an hour, and to perform these evolutions, if need be, at an altitude of several thousand feet.

Now, to apply these facts to the actual theater of war, let us suppose that the general in command of the Russian army at Mukden had been in possession of half a dozen improved aeroplanes of the Wright brothers' type, and ask what would have become of the famous Japanese strategy, by which the eventual evacuation of Mukden by the Russians was brought about. A two-man aeroplane starting from Mukden, and carrying an operator and an intelligence officer with his sketching pad and notebook, and making a long, circular sweep to the westward, would have enabled the Russian commander-in-chief to keep in close touch with that famous flanking movement of Gen. Nogi's which decided the issues of the eleven days' fight. Soaring to a height of 1,000 or 1,500 feet, the machine would have carried the scouting party over the whole of the country covered by the flanking force, where note would have been taken of the numbers and character of the troops, the number of field pieces, and any and every detail of information that might be of use. From his lofty elevation the intelligence officer could have quickly sketched out a map of the chief topographical features of the country below, and on his return, the Russian general would have been put in possession of all necessary information to enable him to intercept the movement. As a matter of fact, the possession of a fleet of scout airships by two opposing armies would mean the complete demoralization of the art of war as it is now practised. Flanking movements; the position and strength of reserves; masked batteries; concealed troops; and unsuspected difficulties in the natural lay of the ground on the field of operations, would be perfectly well known to the enemy. The game of war would become almost as ridiculous as a game of chess in which each player told his opponent what was his general plan of attack, and what, in all probability, would be his next move. It certainly looks as though the present rapid development of aeronautics would reduce modern war to something very much like an absurdity; unless, indeed, some form of gun of small weight, great velocity, and capable of being trained rapidly over wide areas of the heavens be devised, that can "wing" an aeroplane at several thousand yards.

PEARY'S QUEST OF THE NORTH POLE.

On Tuesday, July 7, the good ship "Roosevelt" started on her second voyage to the Arctic, and two days later Commander Peary left by train for Sydney, Cape Breton, where he joined the ship. Here the balance of the stores were taken aboard, and the crew, made up principally of men accustomed to Arctic navigation, was brought up to its full complement. From Sydney the ship will go to Hawks Harbor, where 25 tons of whale meat will be taken on board. She will then cross Davis Strait to Holstanberg, and proceed up the coast to Cape York. At Etaw the expedition will pick up the Esquimaux, upon whom reliance will be placed for the final dash by sled for the North Pole.

If experience counts for anything (and nowhere does it count for more than in Arctic exploration) the intrepid explorer stands a better chance of finding the object of his quest than any of the numerous explorers who have preceded him. No one man can compare with this naval officer in Arctic experience, and it is certain that no previous expedition has been so well found. The "Roosevelt," designed especially for this work, is a better ship than she was when in this same month, just three years ago, she started on her maiden voyage for the frozen North; for considerable changes have been made in the vessel, both in motive power and equipment, all of which were based on the valuable experience gathered during the last venture.

The "Roosevelt" is 160 feet long on the waterline, 184 feet over all, with a beam at the waterline of 32 feet. She is 16 feet 6 inches in depth, and at full load displaces 1,500 tons. Designed, both in form and structure, to meet the severe conditions of the Arctic seas, she is considerably the strongest vessel ever built. She is very round below the waterline, with easy bilge and very sharp dead-rise; the wedge-shaped section of the hull being designed to cause the vessel to lift when she is being nipped by the ice. The enormous strength of the ship may be judged from the following details of her construction, remembering that she is built very largely of selected white oak. The frames, which are molded to 16 inches at the heel and 10 inches at the head, are placed only 2 feet apart from center to center, and they are reinforced by a longitudinal lattice-work of diagonal straps of steel laid throughout the full length of the ship. The skin of the ship is 10 inches in thickness laid in two courses, the outer of which is of white oak, while the inside of the frames is covered with 3-inch white oak ceiling. With three layers of planking and a sheathing of tarred canvas between the outer two, the ship will be not only water-tight, but thoroughly warm in cold weather. The beams of the main deck are spaced 4 feet apart, center to center, and a system of heavy diagonal struts is worked in between the beams. In fact, the interior of the "Roosevelt" is a complicated system of horizontal and vertical trusses of great strength. Protection against the grinding effect of the ice is afforded by extra sheathing of hard wood over which is laid ¾-inch steel plating at the most exposed parts. The motive power of the "Roosevelt" is sufficient to give her about 11 knots an hour; but she will steam to the North at a lower speed, with a view to saving fuel.

Peary expects to reach the North Pole in the spring of 1909. With average conditions in the Arctic he hopes to reach the most northerly point of Grant Land, or say about latitude 83 deg., before he is frozen in. Temporary houses will be built on shore, and the crew will be occupied during the winter in preparing the outfit for the sled expedition, which will include fur clothing, sledges for the 420-mile journey to the Pole, harness for the dogs, and the repairing and packing of provisions. The start of the sledge expedition will be made a week or two before the sun shows his rim above the horizon, or early in February. The party will be made up of about twenty-five sleds, with six dogs and one Esquimau with each sled. At the start they will be heavily loaded with provisions, and if Peary makes as much as 10 miles a day going out, he will be satisfied. Coming back, when the provisions have been largely consumed and the load is lighter, he will make about 15 miles a day. Peary expects to locate his base of supplies and winter quarters somewhere in the vicinity of Cape Sheridan; and he stated, just before leaving, that if he should reach the Pole next winter, the news of his success will be received in New York some time between August 15 and September 15 of next year.

TEST OF SAFETY DEVICES BY THE PUBLIC SERVICE COMMISSION.

The Public Service Commission has done most excellent work during the twelve months it has been in existence, and its recent decision to hold a public test of fenders and wheel guards suitable for use on the street railroads of Greater New York is highly commendable. That street railway accidents, and particularly the running down of pedestrians, are altogether too frequent, must have been evident to the observant citizen of New York; but it has been re-

served for the statistics gathered by the Public Service Commission to bring home to the public the really frightful character of this menace to life and limb. The tests will be held within the next three months at the General Electric Works at Schenectady, and at the works of the Westinghouse Electric and Manufacturing Company, Pittsburg. The Schenectady trials will probably take place early in September, and will be followed by tests at Pittsburg one month later. Inventors and manufacturers of fenders and wheel guards from every State in the Union will be invited to participate, and to present their inventions for practical demonstration.

The decision to hold these tests is the outcome of the first year's experience of the Public Service Commission. Organized on July 1, 1907, the Commission had not been in office three months before the humanity of its members was shocked by the terrible mortality due to accidents on the street railroads. Under the Public Service Commission law, it is the duty of street railroad companies to report to the Commission at once every accident occurring on their lines resulting in loss of life, serious injury to persons, or great damage to property. For the first time it was possible for a public agency to collect the statistics of such accidents and focus the results in a series of monthly tabulations. It was found, much to the surprise and horror of the Commissioners, that the street railroads of Greater New York were killing men and women at the rate of 40 or 50 a month, and for the last six months of 1907, the number killed in this way aggregated 288, an average of 48 a month. To end such havoc with life and limb, became the Commission's immediate task. It had general investigations made of operating conditions on all lines of street railroads, and appointed a special committee on safety devices to receive and consider suggestions, inventions, and existing devices for the prevention of accidents. This committee consists of A. W. McLimont, electrical engineer of the Commission; Daniel L. Turner, chief engineer of the Transit Inspection Bureau; and George F. Daggett, chief of the Accident Bureau. Since its appointment last fall, the Committee on Safety Devices has had meetings every week, and has received innumerable suggestions for the prevention of fatal accidents. Inventors who have solved the problem only in their own brains; those who have gone a step further, and protected their ideas by patenting; as well as proprietors of marketable inventions, which are already manufactured and in general or restricted use, all flocked to the committee to have their devices tried.

As it became apparent from the reports of accidents that a large number was due to defective or imperfect fenders, or wheel guards, so the inventive talent of the country sensed the critical point, and by far the larger number of inventions submitted to the committee related to fenders and wheel guards. All these have been carefully examined, and so far as possible, given model tests in the offices of the Commission; but the committee soon determined that, in order to reach a just conclusion and to properly gage the merits of competing inventions, it would be necessary to hold public tests in a practical way. Its recommendation that the Commission provide for such tests was favorably considered, and after months of consideration, the forthcoming competitions at Schenectady and Pittsburg were arranged for.

It was found by personal investigation that the General Electric Works at Schenectady, and the Westinghouse Works at Pittsburg, not only afford every facility in the way of tracks, trolley wires, cars, motormen, etc., for such tests, but that neither the General Electric Company nor the Westinghouse Company has any interest whatever in any device which will enter into the competition. Hence they offered the best *locale* in the country, in the estimation of the Commission's engineers, to insure the impartiality of the test.

To test the qualities of a fender, dummies will be used to represent persons. These will be placed on the tracks, and will be run into by the cars with fenders attached at speeds varying from eight to twenty miles an hour. There will be three dummies, the largest one weighing 170 pounds, to represent a full-sized man; another weighing 120 pounds, to represent a youth; and the smallest weighing 50 pounds, to represent a child. Ten different tests with each dummy will be called for, including an upright posture facing the car and away from it; an upright posture with the side of the body toward the car; the position of lying on the track in various attitudes, and lying along the rail with head and arms in dangerous positions.

THE PRESENT POSITION OF THE DARWINIAN THEORY.

Many objections have been urged against the Darwinian theory. For example, most of the land birds of the Galapagos Islands are peculiar to those islands, but their close resemblance to South American species proves their descent from the latter. Why could not the differences have been produced by the direct influence of local conditions, without natural selection? Plants of the same species grow vigorously in rich soil but remain small and weak on poor soil, and flat fishes change color when removed to sea bottoms differing in hue from their native grounds. The question whether such direct effects of environment are hereditary is not yet decided, but there is no lack of other evidence in favor of the Darwinian, and against the Neo-Lamarckian theory. It would be a very remarkable coincidence that cold should produce directly, in nearly all Arctic animals, the white coloration which is so eminently useful to them. The only exception among land animals is the carrion crow, to which whiteness would not be useful, either in obtaining food or in escaping foes. Many spiders which spin nets and lurk behind them are brightly colored, but hunting spiders can with difficulty be distinguished from their environment. Everywhere we find similar instances, which cannot be explained by the direct effect of local conditions but are in perfect harmony with the theory of natural selection and the survival of the fittest.

A second objection relates to the initial stage of useful characters, for the utility of this initial stage is not apparent. For example, many hymenopterous insects have on their forelegs a complicated apparatus for cleaning their antennæ. It must be admitted that a rudimentary and therefore useless cleaning organ could not be explained by natural selection. The organ, however, pre-existed in the spur, common to all insects, which serves to steady the body on an uneven surface. The spur could also be used to clean the antennæ and it gradually assumed, by natural selection, a form better adapted to this purpose. Here we have an instance of change of function of an existing organ. The beginnings of useful characters can generally be explained in this way.

A third objection is based on the frequent occurrence of characters, such as the ornamental plumage of many male birds, which appear useless, or even prejudicial. To meet this objection a seeming digression is necessary.

Recent researches have proved that every animal species has its definite place in the economy of nature. The bank swallow and the house swallow resemble each other very closely and are probably descendants of a common stock. The former broods in holes excavated in river banks, the other in nearly closed plastered nests attached to house walls. Probably their common progenitor utilized natural rock and earth cavities. Birds possessed of some skill either in digging or in plastering could improve their nests and their chances of producing offspring. Both of these useful characters would be inherited, and improved by natural selection. But why the sharp distinction into two species? Why, for example, do we not find diggers mating with plasterers? The house swallow, seen from above, is blue-black, and the bank swallow is grayish brown, like the earth in which it digs. This character, being useful in shielding the nest diggers from observation, would also be improved by natural selection. But, again, why the sharp separation into two distinct types and why do not some light-colored birds seek darker mates? To explain this we must assume a natural selection of another sort. As a rule the offspring of such a cross would have little skill either in digging or in plastering, while the mating of two light or two dark birds would produce good diggers or good masons. Hence the preference of birds of either type for mates of the same type would be of advantage and this preference would also be strengthened by natural selection.

When the superficial and auxiliary character which determines sexual selection is itself useful, as in the case of the bank swallow, this character (the earthy color) is equally developed in both sexes. When it is not useful it is developed most strongly in the male. This is the case with the black back and yellow rump of the house swallow. It may even be developed to an injurious extent by sexual selection and is then mostly confined to the male. Examples of this are seen in the brilliant plumage of male birds, whose mates, more exposed to danger in brooding, are very soberly clad. The females of birds that nest in caves are as brightly colored as their mates. The same is true of females that are well able to defend themselves, for example, wasps and bumble bees. In the latter case the conspicuous color is even useful in warning away disturbers.

The degree to which useful characters can be developed is determined by the competition of other species. Hence all animals are, in a sense, equally highly developed. To the constantly increasing division of labor in higher animals corresponds an increase in the complexity of the functions of protoplasm in lower animals. It is an error to assume that the vital processes (assimilation, reproduction, etc.) have always been as highly developed as they are now, for they also have been improved by natural selection in the struggle for existence.

The first living creatures differed from modern higher organisms by the absence of division of labor and from modern lower organisms by simplicity of vital processes. These considerations throw a new light on the origin of life. Primitive organisms coming into existence now would be instantly destroyed by bacteria, but in the beginning there were no bacteria and the spontaneous origin of life was possible.

The degeneration of organs has been brought forward as an objection to the theory of natural selection. Darwin himself thought it necessary to attribute to disease the degeneration of the eyes of cave-dwelling animals, forgetting that the formation and maintenance of useless organs, at the expense of useful organs, is detrimental and that such organs must consequently dwindle and finally disappear under the influence of natural selection.

Still another difficulty has been found in the failure to construct the pedigrees of living animals from the fossil remains of extinct species. But it is exceedingly difficult to determine the common ancestor of two species. It is commonly assumed that this ancestral form represents the mean of its descendants, but this is certainly erroneous. If the bank swallow should divide into two species distinguished by new characters, the lightness of hue, which distinguishes it from the house swallow, would still go on increasing, so that both new species would be lighter than their common ancestor. Hence the small size of some of the apparent ancestors of the horse presents no difficulty, and it is not surprising that no intermediate form between man and the anthropoid apes has been found. The human characters of these apes have probably become more pronounced since the separation, and the common ancestor may have been more like the lower monkeys than like the anthropoid apes.

The theory of natural selection assumes vital processes, heredity, variability, etc., as facts of observation and it is entirely independent of the theories that attempt to explain those fundamental data.

SCIENCE NOTES.

In manufacturing operations it is frequently necessary to use apparatus that is not affected by acids. In cases in which glass, porcelain, and similar materials are inadmissible the best material is platinum but the cost of this metal is often prohibitory. M. Jouve recently exhibited to the French Society of Civil Engineers a series of alloys to which he has given the name "metillures." They are silicides of iron and manganese, which contain a very large proportion of silicon and resist the action of strong acids, hot or cold, much better than the most resistant specimens of cast iron. For example, apparatus made of these alloys can be employed in distilling nitric acid, or in concentrating sulphuric acid to 66 deg. Baumé.

The Prussian forests, covering nearly 7,000,000 acres, are made up much as if we should combine the pineries of the Southern States with the forests of some of our Middle Atlantic and Central States. When forestry was begun a great part of them had been injured by mismanagement, much as our forests have been, and the Prussian foresters had to solve the problem of improving the run-down forests out of the returns from those which were still in good condition. They solved it with striking success. Immense improvement has already taken place and is steadily going on. The method of management adopted calls for a sustained yield—that is, no more wood is cut than the forest produces. Under this management the growth of the forest, and consequently the amount cut, has risen sharply. In 1830 the yield was 20 cubic feet per acre; in 1865, 24 cubic feet; in 1890, 52 cubic feet, and 1904, 65 cubic feet. In other words, Prussian forest management has multiplied the rate of production threefold in seventy-five years. And the quality of the product has improved with the quantity. Between 1830 and 1904 the percentage of saw timber rose from 19 per cent to 54 per cent.

THE CURRENT SUPPLEMENT.

In Chicago meat-packing establishments, electricity is employed very extensively and to great advantage. Mr. Frank C. Perkins, in the opening article of the current SUPPLEMENT, No. 1698, shows how the old system of shafting, belting, and pulleys has been supplanted by the electric drive. The making of briquettes with tar is described. Lawford H. Fry writes on combustion and heat balancing in locomotives. The Duddell thermo-galvanometer, an instrument for measuring the extremely small currents and potential differences in the aerial wire of a wireless receptor, is described by A. Frederick Collins. Mr. R. H. N. Robinson, of the United States navy, gives a description of the experimental model basin and of its functions and operations. How the speed of an aeroplane may be determined is explained by Dr. A. F. Zahn. The article on the making of moving pictures, which was begun in the previous issue, is concluded. Prof. A. Michel-Levy contributes a very good review of the work which has been done in artificially reproducing rocks and minerals. M. A. Lane contributes an article on August Weismann and his work. A. Cressy Morrison writes a general article on acetylene.

A NOVEL MUSIC STAND OR BOOK REST.

BY I. G. BAYLEY.

To make a music stand or book rest, such as shown in Fig. 1, out of one and the same piece of wood, without joining or the use of pins, seems almost impossible. Nevertheless, a novice, so far as the use of woodworking tools is concerned, will be able to make one by following the instructions here laid down.

The size of the stand will depend upon the use to which it is intended to be put. If for a music stand or a large book rest, eighteen inches wide by three feet long will be a nice size. If intended for the table, for smaller size books, the length would better be only eighteen inches, the same as the width.

The board should be one and one-eighth inches thick, free from knots, cracks, and other defects. Either walnut, oak, or mahogany will do.

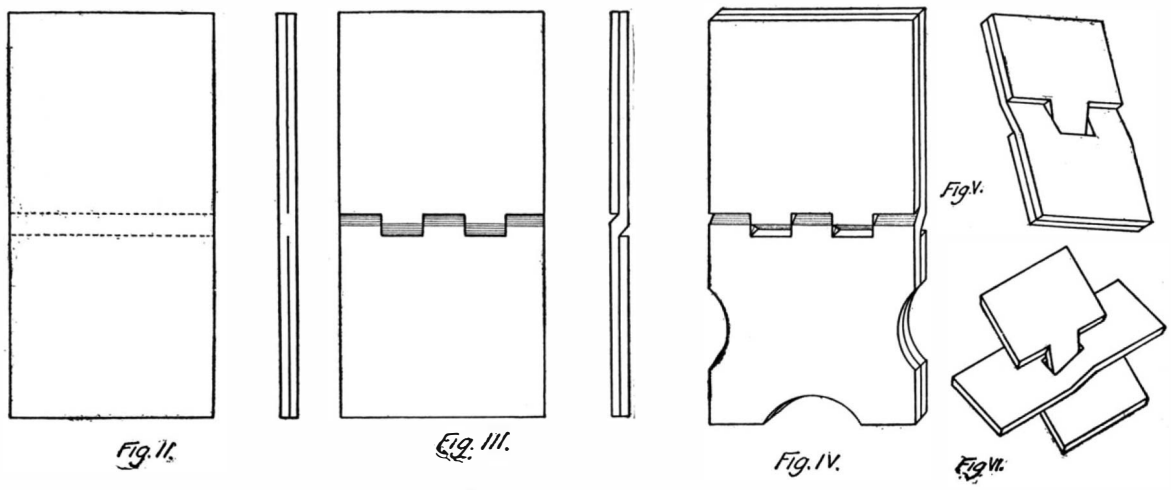
It would be well for a novice, in fact it would save time in any case, to have the saw cuts shown in Fig. 2 done at a mill or carpenter's shop. As seen by the dotted lines and in the end elevation, these cuts do not extend the full length of the board, but to within two inches of each other, at the center of the timber.

The board being cut, the next step is to mark five equally-spaced divisions, as shown in Fig. 3. The four short vertical lines are to be cut straight through the board, but the horizontal lines, joining them at the top and bottom, must only be cut half way through, or to the saw cut. The parts shown shaded are cut with a flat chisel, at an angle of forty-five degrees from the center, down to the vertical cut of the horizontal lines, as clearly shown in the side elevation. The board is now turned over, and the same cutting done, but alternately, as clearly shown in Fig. 4, and in the halftone cut, Fig. 1.

The lower part of the stand can be cut out as shown in Figs. 1 and 4, or ornamented as may be desired, but the upper half should be kept perfectly plain. The whole must be sandpapered down, first with rough and then with fine paper, and afterward varnished or stained.

To hold the stand in a certain position, according to the use to which it is being put, an ornamental brass chain is connected across the bottom, by means of a screw eye at one end and a hook at the other. The stand can be folded and leaned against the wall when not doing service.

A small model of the stand makes a very interesting puzzle. If made as shown in Fig. 5, the two pieces of wood can be separated and twisted around at right angles to each other, as in Fig. 6. The device can then be given to a friend with a request that he get the two pieces apart, without breaking them. If the wood is sandpapered, and robbed of all traces of saw cuts, etc., the "puzzle" will deceive the most wary.



A MACHINE FOR HANDLING COKE IN THE YARD.

A radical departure from the method ordinarily employed to handle storage coke is illustrated on our front page.

Owing to the fact that coke is a very friable material, the use of a grab bucket or a steam shovel is avoided where it is possible to do so; for it is necessary that the coke be delivered to the furnace in large pieces, and both of the above-named devices materially break up the fuel. The scraper conveyer of the machine here illustrated moves at a slow speed, and mechanically takes the coke from the base of the pile without in any way damaging it. The conveyer is filled by the coke rolling down the pile.

The photograph shows the machine at work on one end of a yard at Stockton, Ind., where it is loading coke from a strip or siding one hundred feet wide, extending along the railway track about half a mile.

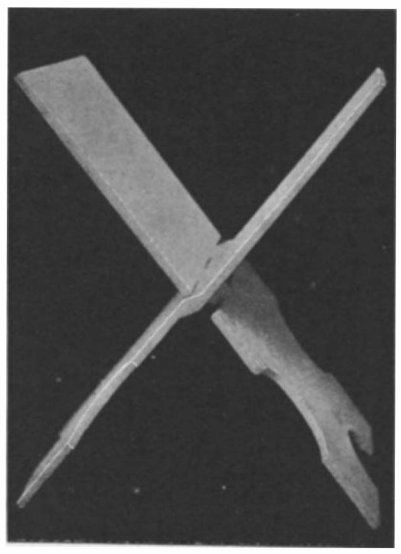


Fig. 1.—A Music Stand Made, Without Joining, of Two Intermeshing Pieces.

In one run, 4¾ hours' time, there were loaded 24 steel hopper-bottom cars, containing in all 732 tons of coke. Three men operated the machine at a cost of $7 a day for wages, making the cost per ton for loading less than one cent. The cost of loading this material by hand, which was heretofore necessary in order to prevent breakage, is 19 cents a ton. The machine consumed an average of 20 E. H. P., which may be counted at 30 cents an hour. Adding this to the labor cost gives a total actual cost of a cent and a half per ton for the coke loaded. This means a saving over hand loading of about $125 on the day referred to, exclusive of charges for depreciation.

The machine delivers the coke into the car in very much better condition than is done even by hand loading, and it is estimated that a saving of probably 5 per cent will be made on this point alone. Coke on the yard costs about $5 a ton, and this saving may be reckoned at 25 cents a ton. The machine has four times the capacity of a locomotive crane and grab bucket, and handles the material without breakage.

The same argument as to breakage applies to stocking the coke on the yard, for the machine also does this part of the work. The coke is dumped on a platform from hopper-bottom cars, on the trestle, the nose of the machine being swung underneath the trestle; the delivery conveyer stocking the coal at the apex of the pile, which may be as high as 40 feet, if desired. The common method of putting coke into storage has been to dump a trainload of coke on the yard, jack up the track on top of the coke, and continue this operation until the grade the track takes to the top of the pile prohibits further storage. In doing this, every three feet of the pile is successively pounded down by a locomotive and train of loaded cars. The coke that is used for ballast in this way is poor stuff for the furnace man. The machine delivers the coke to the top of the pile without any drop, as the delivery conveyer may be raised or lowered to suit the height of the pile. When the pile has reached the desired height, the machine moves by its own power a few feet farther down the platform.

A Coke Storage Pile 100 Feet Wide and Half a Mile Long. The Machine is Shown at the Extreme Left.

A MACHINE FOR HANDLING COKE IN THE YARD.

The Evolution of the Book Stand.

A NOVEL MUSIC STAND OR BOOK REST.

A Puzzling Bit of Woodwork.

The Difference Between a Hydroplane and a Gliding Boat.

Structures embracing notch-bottom hulls are not hydroplanes, but gliding boats, as are also all those whose operation entails the use of supporting plates brought to the surface of the water, which is unavoidable in the absence of means for regulating the lifting force of said plates.

The known methods of regulating the lifting force of a hydroplane plate are either to reduce its angle relatively to a longitudinal horizontal line as the speed increases, or to superpose upon it other plates which shall rise above the surface of the water, and thereby reduce the supporting area as the speed increases.

The word "hydroplane" properly applies to those boats designed to ride on submerged "planes," as distinct from the type that splash along the surface with the front edge of the plates protruding, the relation of which latter plates to the water is similar to that of the bottom of a motor boat.

The submerged plate of a hydroplane proper, being below the waves and foam of the surface water, may be compared, for illustration, with the supporting surface of an aeroplane. As a matter of fact, the upper surface of a hydroplane plate is almost as efficient as is the lower surface.

It is mentioned in an item in the Horseless Age that the city of Milwaukee will, in a short time, use no horses for municipal purposes, except to draw fire engines. The city officials are convinced that the automobile is so far in advance of the horse in cost, maintenance, and utility, that there is hardly any room for a comparison.

A MULTIPLE MOLDING MACHINE.

BY JAMES COOKE MILLS.

A new invention covering certain useful improvements in methods of forming sand molds has recently been introduced in the iron and steel world, and is acknowledged to be an important factor in foundry practice.

In the present state of the art it is almost universal practice in the formation of sand molds to fill the loose sand into the flask upon an up-facing pattern and then to compact the sand either by tamping or by pressure. The advantage of this method is that the interstices of the pattern are filled with sand by gravity, while the impact of the sand against the pattern face causes a certain degree of compression. As a consequence a perfect imprint of the pattern is thus initially formed and the subsequent tamping or pressure will impart the proper degree of hardness to all portions of the molding-face.

In multiple molding, where it is necessary to form molding-faces upon opposite sides of the flask, the lower face only can be formed by this method. It has therefore been found impracticable to form a good imprint of the pattern upon the upper face of the sand for the reason that the movement of the pattern into the sand will cause the projecting portions to carry the sand away from the face of the depressions or interstices of the pattern, leaving soft spots in the molding-face, which will not retain the proper shape. Thus gravity, which assists in the formation of the molding-face against the upturned pattern, has precisely the opposite effect in the formation of the face by the down-turned pattern.

With the present invention difficulty of forming an imprint of the down-turned pattern is overcome by increasing the velocity of movement of the pattern relative to the body of loose sand to such an extent as to practically eliminate gravity as a factor and to compact the sand against the pattern-face by inertia. This may be accomplished either by moving the sand-holder upward relatively to the stationary pattern or by moving the pattern downward relatively to a stationary sand-holder; but in either case the essential factor is the requisite velocity of the moving part. In carrying out the improved method the inventor, John A. Rathbone, employs a molding machine such as shown in the accompanying illustrations.

With all its complexity, the machine is simple in operation and its action is positive. The operator sets an iron flask on the flask frame so as to engage the pins with the holes in the lower lugs of the flask.

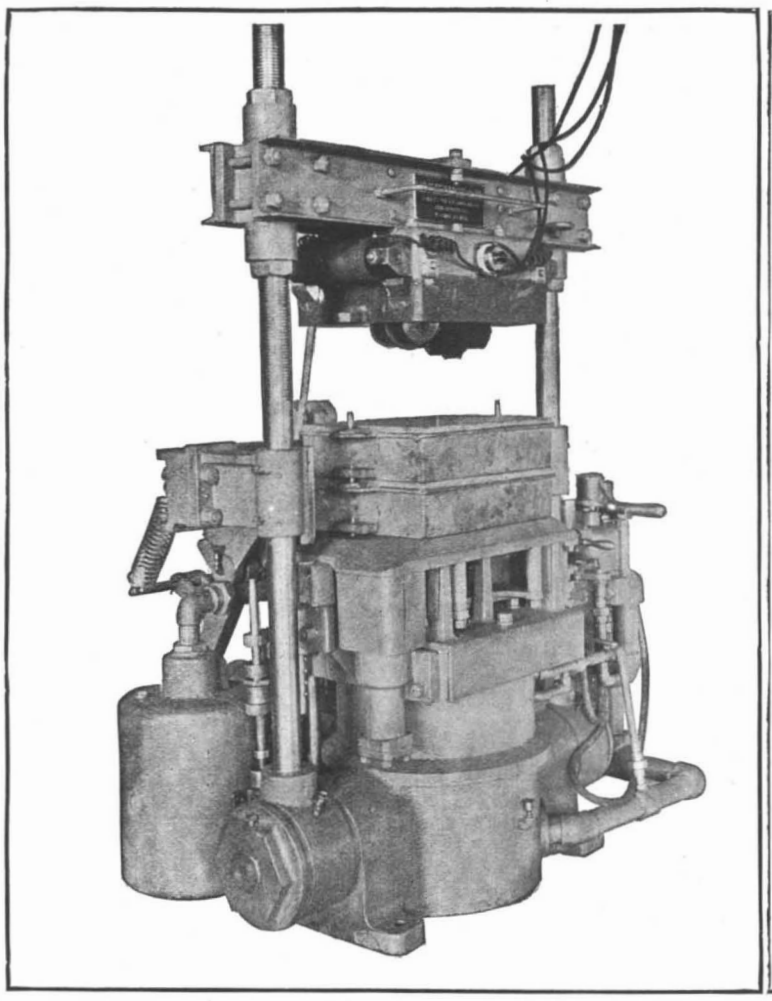


Fig. 1.—View Showing Yoke Swung Forward, the Drag Pattern, and Sand Frame Held by Magnets.

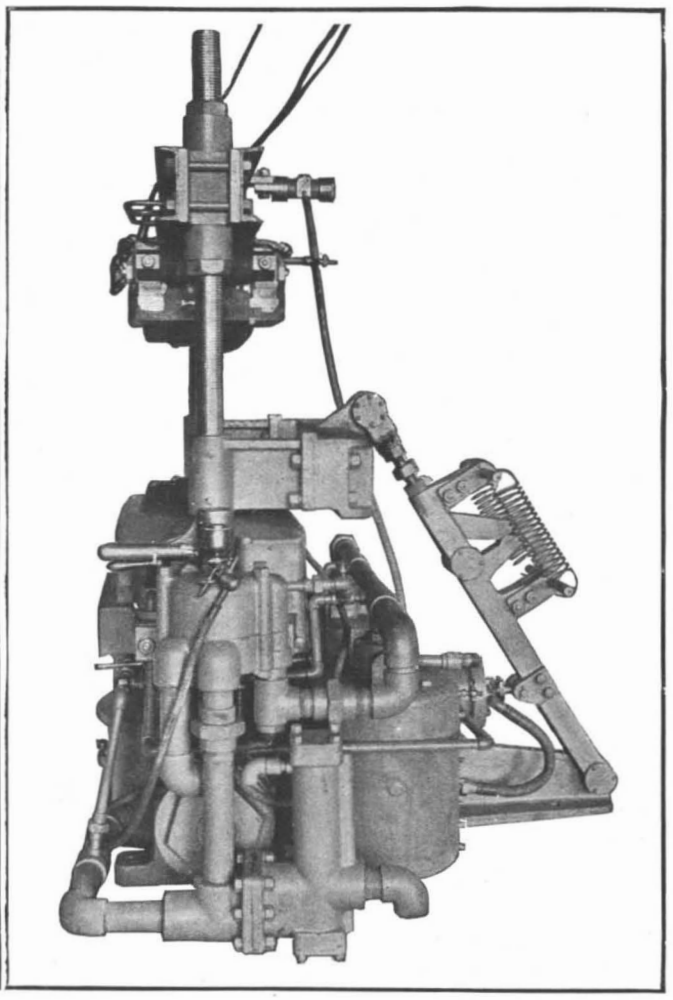


Fig. 2.—Side View of the Machine With Flasks Removed and Cope Pattern Ready for Operations.

A MULTIPLE MOLDING MACHINE.

Within the frame and secured to the mold head is the cope pattern. He riddles the facing sand over the pattern until it is entirely covered, and places the narrow sand frame over the flask with the pins engaged. The molding sand is then shoveled in, completely filling it, and leveled off smooth flush with the edge. By turning the smaller valve to the right, the yoke mechanism is brought forward by the action of a pneumatic ram and made secure in its position by a toggle joint behind. The drag pattern is now in place ready for ramming. The operator turns the air valve to the right, and the mold frame under the pressure of ten tons exerted by the ramming head makes a tremendous thrust upward, thus effectually ramming both cope and drag molds simultaneously by the same motion. The vibrator to jolt the drag pattern is automatically set in action. The switch having been turned, the electro-magnets hold the sand frame while the mold frame is carefully drawn away from the drag pattern by the reverse action of the ram. The drawing of the lower or cope pattern is done in precisely the same way. The flask frame is raised from the mold head containing the cope pattern, by small pneumatic rams, leaving the completed mold free for stacking. The yoke is swung back and the mold lifted off. The patterns are cleaned by a jet of air through pressure hose.

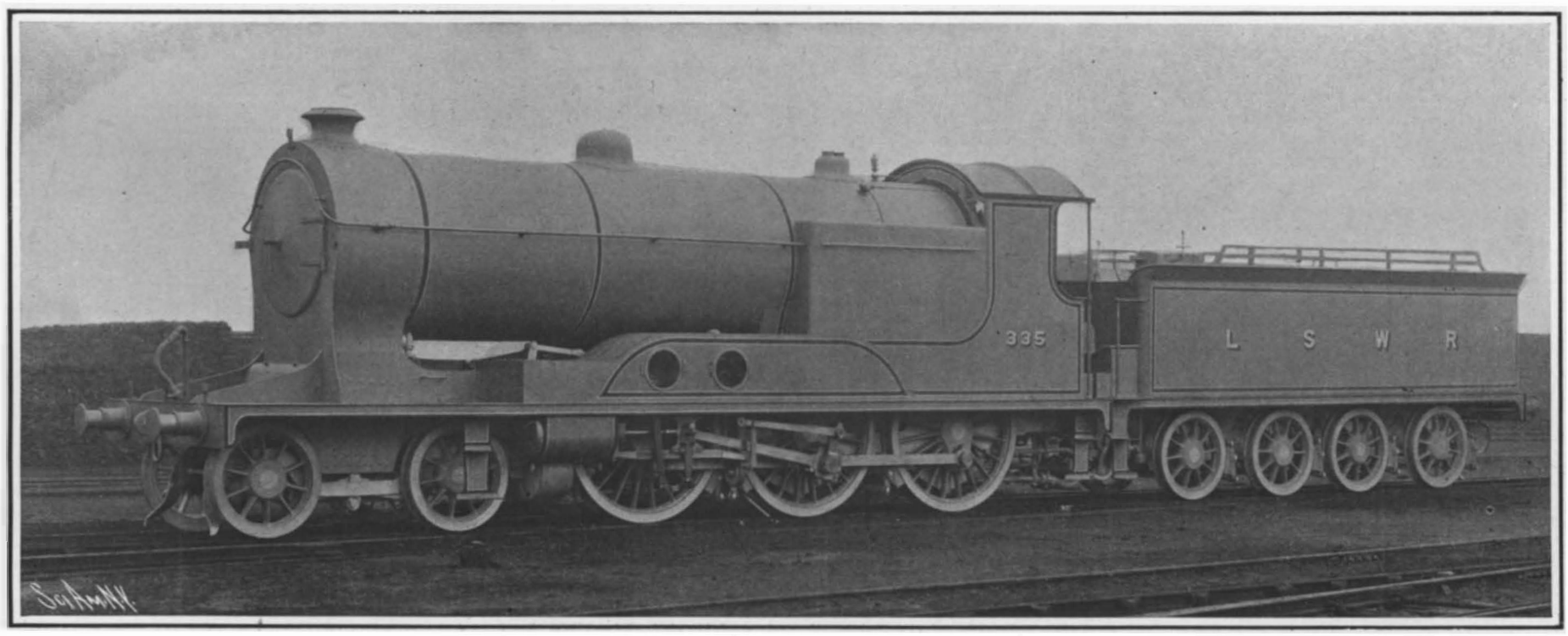
The next mold is made in the same manner, except that the sprue for the mold now formed between the first and second flasks is cut through it automatically by the machine. So mold after mold is made until, determined mainly by convenience in pouring, the topmost one is in position, when a larger pouring basin is shaped upon it and, if thought best, a pouring weight is added. Except for the top mold, no weight is needed, as the lower molds' joints are made good by the weight of the upper molds upon them.

It is generally supposed that the lower molds must be strained by the head of the liquid metal above, but, by a judicious apportioning of the section of the gate to the massiveness of the casting, it may be caused to just feed it without straining and, for most of the work for which multiple molding is suitable, it is sufficient that the gate should be thinned down so that it has set by the time the second mold above is filled and the head is on the point of being increased by the filling of the sprue above.

A NEW BRITISH LOCOMOTIVE.

BY F. C. COLEMAN.

The competition between rival railroads on long-distance runs, and the changes in urban local travel due to the opening of new suburbs and the competition of street railways, have led to a live forward movement in British locomotive engine construction. The latest of these giant locomotives built for long-



Cylinders, four, 10½ inches by 26 inches. Driving wheels, 6 feet diameter. Heating surface, 2,727 square feet. Boiler pressure, 175 pounds.

A NEW BRITISH EXPRESS LOCOMOTIVE.

distance express traffic has just been completed at the London works of the London and South-Western Railway from the designs of Mr. Dugald Drummond, chief mechanical engineer of the company. The engine will run over the London-Plymouth route, a distance of 230¾ miles. Plymouth is connected with London by two competing lines, and as it is a port of call for Atlantic liners there is keen competition for the American as well as the local trade.

It is in accordance with the traditions of British rivalry that the officials of the London and South-Western Railway Company prefer not to make known full details of their new engine.

The engine is four-cylinder, six coupled, the cylinders being 16½ inches diameter, with a 26-inch stroke. The driving wheels are 6 feet in diameter, and the bogie wheels 3 feet 7 inches. The total heating surface is 2,727 square feet, made up of 340 boiler tubes equaling 2,210 square feet, 112 firebox tubes equaling 357 square feet, and the firebox, 160 square feet. The grate area is 31½ square feet, and the working pressure of boiler 175 pounds per square inch.

Four tons of coal and 4,000 gallons of water are carried in the tender; the heating surface of the tubes in the tender well is 382 square feet. The total length, engine and tender, over buffer, is 63 feet and the tractive force on rails is 30,968 pounds.

A SELENIUM PHOTOMETER.

The inaccuracies of the photometric methods now in common use are well known. In many cases differences amounting to as much as ten per cent will exist between the estimates made by different observers with the best available scientific means of comparison. Furthermore, the colors of the lights to be compared are of great importance. The colors differ in the intensity of the effect produced upon the eye of an individual, and there is marked variation between different persons in this respect; so that by some observers two lights of the same color may be compared with considerable accuracy, but a change in the color of the standard will render the determination worthless. In addition, the practical impossibility of maintaining a standard light which will not vary from time to time with the pressure of the atmosphere and its specific composition at the place of test, and with the purity of materials used to produce the flame (a flame being usually employed for this purpose), affects the precision of comparison to a greater or less degree.

The common standard of comparison is the now well known "Pentane" lamp; the color of this standard is toward the red end of the spectrum, and to most eyes it shows decidedly pink. Hence, when an attempt is made to compare a yellow incandescent lamp, for example, with the standard, the results obtained from different observers are often so discordant as to make them of little use; it has therefore become a practice to have a single observer compare a number of incandescent lamps with the selected standard with great care, so as to make them secondary standards, which when burned at proper voltage will give for a considerable period a substantially unvarying light. Obviously, however, this introduces still further inaccuracies, since the lamps will, in spite of all possible care, differ among themselves, and comparisons made with them will necessarily differ by the personal equations of the different observers. In addition these equations vary in different ways with different persons, being dependent as already pointed out upon physiological factors such as the ocular perception of the individual, varying with fatigue and with physical condition, as is well understood.

To obviate all these difficulties Mr. William J. Hammer, a well-known New York electrical engineer, has devised and patented a very simple and ingenious photometer in which sensitivity of selenium to light is practically applied.

In an electric circuit a selenium cell of approved construction is arranged through which a current is passed, the changes in the current, due to the action upon the cell of the light selected for test, being indicated. The specific electric resistance of selenium varies over wide limits under the influence of light. In circuit with the cell and the source of current is included any desirable form of electrical measuring instrument. Preferably an instrument which will show variation in only one electrical quantity, since in any investigation it is best to employ only one variable at a time; but under some conditions other forms of measuring devices may be used.

In Fig. 1, *A* is the battery or other source of current which is to be measured and variations in which are taken as indicative of light intensities. The battery is arranged in circuit with a selenium cell *B*, which is preferably of that form in which the selenium, after being coated upon a suitable conducting support, such as a coil of nickel wire, is sealed in a tube of preferably as nearly perfect a vacuum as can be obtained, the ends of the conducting wire being passed through the glass by means of platinum tips or otherwise; since the current is small, and no great heat is evolved, platinum is not necessarily used.

C is a measuring instrument, in the case illustrated a voltmeter, responsive to small variations of pressure.

Upon a suitable table, *D*, is arranged the lamp *E* to be tested. At *F* is a screen having a hole *f* which may be closed by a slide F^1; in practice it is preferable to place the selenium cell in a light-tight box *M* (shown partly broken away) having free ventilation, so that the indications may not be affected by exterior light; and inasmuch as the effect to be observed is not detectable by examination of the cell, it is necessary to open the box only at long intervals.

The method of operating the arrangement thus described is substantially as follows: A standard lamp of any desired construction, such as the Pentane lamp referred to in the previous description, is placed in proper position adjacent to the apparatus and lighted, being screened completely from the cell; a small current, preferably a small fraction of an ampere, is then caused to flow in the circuit including the cell, and after it has attained a steady value, the fall of potential around the cell is measured by the volt-meter. After this the light of the standard lamp is allowed to fall upon the cell, and the change in the resistance of the circuit (as indicated by the change in the drop) caused by the action of the light upon the selenium is measured and recorded; this then becomes a "constant" of the particular cell employed. After this, the light which is to be compared with the standard may have its specific effect upon the cell determined in the same way. Obviously the indications of the cell for the first specimens constructed must be calibrated by comparison with the results obtained by photometers, since the measurements of light now in use are purely arbitrary and have no relation to any definite physical quantity; but this relation having been once established in the manner indicated may be in-

Fig. 1

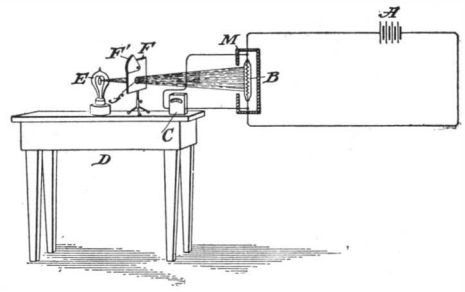


Fig. 2

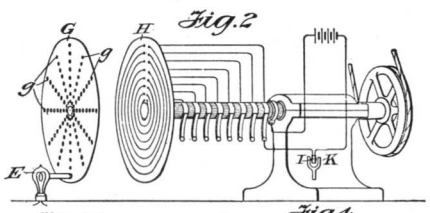


Fig. 3

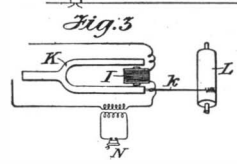
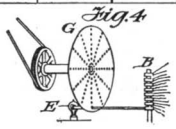


Fig. 4



A SELENIUM PHOTOMETER.

definitely perpetuated by periodic comparisons of different cells to guard against change.

In Figs. 2 and 3, are shown a second means of practising the method. This consists of a siren-disk *G* of well known construction in which the rows of holes *g g* bear to each other certain definite relations, such as the notes of the scale. Opposite to, and rotating with this disk (the perforated disk being shown detached for clearness of illustration) is a disk *H* bearing upon its surface conductors coated with selenium, one for each of the rows of holes *g*. The ends of the conductor go to collector rings rotated with the shaft, the whole being driven at constant speed. In the circuit with the collector rings and source of current supply is a coil *I*, disposed so as to affect a tuning-fork *K* provided with a pointer *k*, the amplitude of vibration of which is recorded upon the revolving cylinder *L*, in the manner of a chronograph. The rows of holes in the siren-disk may conveniently be in the relation to the notes of the octave of a tempered scale, and may each be provided with a similar tuning-fork, which at the normal rate of rotation will respond to its appropriate tone; these, being all substantially like the fork *K* and arranged in a similar way, are not illustrated. Such an organization will enable the observer to conduct a number of tests at the same time, when desired.

The apparatus thus described being brought up to normal speed, which should be maintained as nearly constant as possible, the tuning-fork *K* will begin to vibrate as soon as the standard lamp is turned on, and the amplitude of its vibrations will be recorded upon the cylinder *L*; upon turning off the standard and turning on the lamp to be tested the amplitude of the fork's vibration will indicate the intensity of the lamp to be tested, relative to the standard.

A telephone *N* may be connected in circuit if desired, either directly or inductively, and the note of the fork will then sound in the ear of the observer; an operator with a good musical ear may reach a very close approximation to a correct comparison by the relative intensities of the sounds produced by the two lights; this is, however, open (though in a less degree) to the objections pointed out with respect to visual photometers.

In Fig. 4 is indicated a construction which is cheaper and yet substantially effective. In this figure the cells *B* are arranged upon a stationary support and the siren-disk alone rotates, cutting off and admitting the light by its rotation.

An Earthquake Warning Service.

It is generally known that for the last few years the great earthquakes which have occurred in distant parts of the globe, San Francisco, Chile, Mexico, and the West Indies, have been first announced to Europe, not by telegraph, but by the indications of the various seismological observatories of Germany and Italy. In fact, important tremors of the earth announce themselves in every part of the globe very soon after their occurrence by the vibrations which they impress upon the crust and the entire mass of the earth. There has been organized in Germany an earthquake warning service, operated without the aid of the telegraph, but simply by means of the diagrams traced by recording seismographs for the purpose of indicating promptly to great shipping firms the approximate location of the epicenter, or center of disturbance. After the earthquakes of San Francisco and Valparaiso the Chamber of Commerce of Hamburg asked the director of the local earthquake station for a daily service of seismograph records of the central station of Strassburg and determinations of the probable epicenters deduced therefrom. In consequence of this request a complete service was inaugurated on the following lines:

In order to determine without any ambiguity the approximate position of the center of a distant and powerful earthquake it is necessary to combine the data furnished by three stations; that is to say, by three seismographs. For these stations Hamburg, Strassburg, and Graz were selected. Immediately after a tracing of a distant violent shock is recorded determinations are made at each station of the durations of the two preliminary phases, from which the distance of the epicenter can be calculated by well-known methods. The stations of Graz and Hamburg telegraph their data to Strassburg, which, quickly combining the three results, telegraphs to Hamburg the probable situation of the epicenter. All this is a matter of three telegrams and a few hours of time. On December 4, 1906, this method was applied to data furnished by Strassburg and Hamburg alone and consequently the result was less certain. Hamburg sent to Strassburg the following telegram: "Yesterday 231016, 1849, 2723"; and Strassburg replied: "230954, 1815, 2524. Lesser Antilles."

This meant that at Hamburg the first shock began at 23 h. 10 min. 16 sec., the second at 23 h. 18 min. 49 sec., and the principal shock at 23 h. 27 min. 23 sec. The length of the phases being known it was found that the epicenter was distant 7,550 kilometers (4,660 miles) from Hamburg and 7,400 kilometers (4,598 miles) from Strassburg. Two circles drawn on a terrestrial globe around these two cities as centers, with the radii indicated above, were found to intersect each other in two points, of which one was in the Lesser Antilles, a region particularly subject to earthquakes and hence obviously the place of the disaster. By making use of three stations even this slight ambiguity is removed. It was not until the 7th of December, three days later, that a telegram from New York announced that an earthquake had occurred at Kingston, Jamaica, on the 5th, and it was not until the 26th of December that it was known that the shock really occurred on the 3d. The importance of these earthquake warnings for great shipping firms is quite evident despite the approximate character of the location of the centers derived from the seismograph records.

"Wanted to Buy" Column.

The continued success of our "Wanted to Buy" items which are incorporated with our "Classified Advertisement" column, is most gratifying, and has proven a real help to the manufacturer. One firm writes us as follows: "We thank you for the names furnished us in your last letter, and beg to advise you that with your kindness we are already in possession of an order. This is, without exception, the greatest stunt that was ever inaugurated, and it is an item for which the Scientific American deserves an endless chain of praise."

The Canadian railways had a total length of 22,452 miles on June 30, 1907, or 27,611 miles including double tracks, sidings, and spurs. The greatest mileage in any province was 7,637 miles in Ontario, and the least was 96 miles in Yukon.

Correspondence.

Latticed Compression Members in Bridges.

To the Editor of the SCIENTIFIC AMERICAN:

It is not difficult to agree with the opinion you express in an editorial on "Rectangular Latticed Compression Members in Bridges," that more knowledge is needed regarding the strength of built-up compression members. To the attainment of this end, it is desirable that positive assertions concerning such members by a scientific or technical periodical of high standing should receive the careful consideration of bridge engineers, and should be questioned if they appear to be doubtful or in error. For this reason, I suggest your reconsideration of some of the statements in the editorial referred to.

You state: "We care not how expert may be the board that investigates the bridge; its findings with regard to these chords of novel and untested type will be based largely upon the theories which received such a staggering blow when the Quebec bridge fell."

Before the fall of the Quebec bridge considerable attention had been given by engineers to the theory of columns, and some progress had been made in this regard, but their practice, which was and yet is very diverse, did not, to any great extent, reflect this progress. In general, the numerous formulas in use for determining the main sections of compression members are not the expression of any theory, unless mere conjecture can be called theory, but represent instead formulated judgments; sometimes based on observation and experience, and sometimes made, like the woman who made the pudding, "out of her own head." Assuming the correctness of the now generally accepted opinion (which was expressed by the SCIENTIFIC AMERICAN shortly after the disaster, and given by the Commission which investigated it) that the failure of the chords of the Quebec bridge was due to weak lattice bars, the accuracy of the formula by which the main section was determined was not tested.

Regarding the design of lattice bars, the Commission, in Appendix 16 to their report, stated that "the experience of the Commission is practically the same as that of Mr. Szlapka, for, except the rule in 'Modern Framed Structures,' all the information we have been able to find has appeared in the periodical press since the collapse of the Quebec bridge." The Commission further stated that Mr. Szlapka used a modification of the rule in "Modern Framed Structures," and finally adopted a larger cross section than his method gave; and they commented: "If he had tested the method fully, he would have found it capable of giving areas ranging up to ten times the area computed by him, a result which would have shown the unreliability of this method." This "theory," if a method which admits of getting almost any result can be called a "theory," as far as the writer is aware has been used very little, if any, in general practice. Instead, engineers have relied on judgment in proportioning latticing. The writer's rule, which the Commission cites, and which, when applied by them to the Quebec bridge chord, required an area of 3.78 square inches for the lattice instead of 1.15 square inches as designed, was not a theory, but an expression of judgment, as was stated when it was first published in 1891.* It does not appear that generally accepted theories regarding columns received a blow when the Quebec bridge fell, but rather that individual judgment was faulty in a matter regarding which engineers have relied almost exclusively on judgment.

You state in comparing a compression member with four webs in which the lattice extends across the entire face, with a similar member in which each outside pair of webs is independently latticed, that "it should be remembered that the latter trussing, because of its slight depth, is, for a given weight of latticing, greatly inferior to latticing which extends the full width of the chord." This statement should be qualified. The deep truss will be stiffer, but not necessarily stronger.

In trusses with parallel chords under a given transverse load, if the chords are weaker than the web members, an increase in depth will strengthen the truss; but if the web members are the weaker, a deeper truss with the same inclination and size of web members will have no greater strength, as the stress in the web members depends on the shear and inclination of the members, and not on the depth of the truss. In compression members the situation is more complicated, and it is difficult to generalize. The shear is not a known quantity, but depends on a variety of causes, one of which is imperfect butt joints. For a given angle between the ends of unstrained abutting members, in loading the bridge, a greater shear will be developed, in bringing the ends to a full butt, if the members are deep in proportion to their length than if they are not.

When the lattice extends across the full width of the member, unless additional provision is made, the bracing of the interior pair of webs will be imperfect, as was pointed out in the appendix to the report of the Commission previously referred to.

You further state: "There is only one certain way to determine whether these chords are able to take care of the enormous loads which will come upon them, and that is to build a model of say one-third full size, and test it to destruction in a testing machine." The writer does not dispute or underrate the importance of tests of full-sized or model members. When intelligently conceived and carefully made they can be of great service, especially if the critical conditions are so varied as to indicate their effect; but he does not consider the result of a test of this kind as conclusive regarding the strength of similar members in actual service. In this regard it may be well to again refer to Appendix 16 to the report of Commission on Quebec Bridge. The Commission made statements bearing on this question in substance as follows: that the stresses in the lattice depend, in large part, on the obliquity of the line of thrust with reference to axis of the member, that obliquity depends upon excellence of design, accuracy of workmanship and precision in erection, that it is impossible to estimate the obliquity with accuracy under any set of conditions, but reasonable limits will doubtless be learned from experience and study; and that "a lattice column placed in a testing machine may fail in the web system, but this is no indication that the lattice system is strong enough for service in a similar column when in use as a bridge member. It may be that the obliquity of the load was too small to develop the lattice strength, and considerably less than the obliquity that would be found to exist on the bridge. With a greater obliquity the column might fail through the lattice system under a much smaller load."

The writer purposely refrains from any discussion of the Blackwell's Island Bridge, as he intends this letter as a purely academic discussion of the particular points mentioned. HENRY S. PRICHARD.

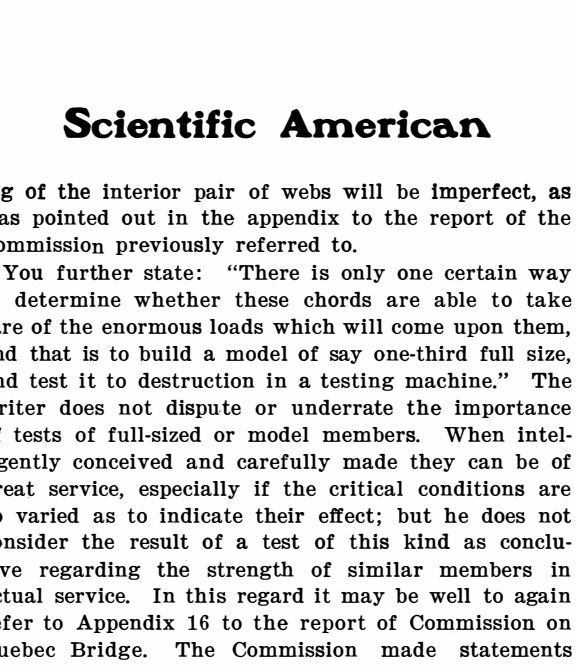
1526 Frick Building, Pittsburg, Pa., June 15, 1908.

* The Lehigh Quarterly, June, 1891, pp. 158, 159.

A Motor-Driven Kite.

To the Editor of the SCIENTIFIC AMERICAN:

As I am a constant reader of your very interesting journal on this side, and knowing that you have seriously taken up the question of aerial flight, I give you an idea which I think may go some way to solve the problem, within certain limits, in a very simple way, and which you are at liberty to make use of for the benefit of your readers, some of whom perhaps may be able to see their way to take the matter up on these lines.



A MOTOR-DRIVEN KITE.

My idea is to use an ordinary man-lifting kite, such as Cody's, and at the ground end of the cord to fix an ordinary petrol motor with propellers, mounted on a light carriage to obtain the necessary momentum.

I think, in practice, with the apparatus properly proportioned, it should be capable of rising from the ground and being propelled in a horizontal direction also. Initially, a wind should be prevailing for the ascent of the kite; afterward, especially when going against the wind, the lift would increase, I suppose, as the square of the velocity, provided the kite remained in equilibrium, but this would have to be tried before saying definitely that this is the proper ratio. Anyhow, if any of your wealthy readers care to adopt my suggestion, they are at liberty to experiment on the same. L. H. NICHOLSON.

London, England.

The Curiosities of Numbers.

To the Editor of the SCIENTIFIC AMERICAN:

The explanation required by Mr. E. M. Brooks, in your issue of June 27, is very simple. As annexing (or affixing) a cipher to any number multiplies it by 10, it is evident that annexing to any number under 20 (either odd or even) one-half of itself, which will be one digit only or one digit and a fraction, multiplies the number by 10½, i. e., 1½ × 7 times the original number, as stated by Mr. Brooks. As annexing to any number two ciphers multiplies it by 100, the numbers from 20 to 199 inclusive increased as above will of course be multiplied by 100½ (1½ × 67 times the original number); those from 200 to 1,999 inclusive will be multiplied by 1,000½ (1½ × 667 times), and so on, *ad infinitum*. Thus:

19 + its one-half written after = 199½ = 19 × 10½ = 19 × 3/2 × 7.

150 + its one-half written after = 15,075 = 150 × 100½ = 150 × 3/2 × 67.

1,777 + its one-half written after = 1,777,888½ = 1,777 × 1,000½ = 1,777 × 3/2 × 667.

Cowgill, Mo., June 28, 1908. G. B. COWLEY, M.D.

Humane Cattle Killing.

Consul Maxwell Blake reports that in spite of much initial opposition on the part of Scotch cattle killers of the poleax style, a new device is being introduced in the Dunfermline slaughter house as a humane substitute for the old style of killing. The consul describes the new instrument as follows:

The weapon is about a foot in length. The barrel is rifled and the muzzle shaped like the mouth of a bell and angled in order to adapt itself to the slope of a bullock's head. By unscrewing the opposite end from the muzzle the cartridge may be inserted. The breech piece having been readjusted, there is a steel guard protecting the hammer, which sets off the bullet. This guard is not displaced until the weapon is about to be used. When the bullock has been firmly drawn up, the operator places the bell end well up on the forehead, and with a sharp tap of a mallet all is over, the beast generally falling down without a struggle. If the bullet has been properly placed, its path should be along the spinal cord, completely severing it. If the instrument has not been well placed, death is a little longer in ensuing, but in any case there is no pain to the animal. Care in the use of the weapon is all that is required, as it is not a thing which can be handled recklessly with impunity.

THE NEW FRENCH AND GERMAN AIRSHIPS "REPUBLIQUE" AND "ZEPPELIN IV."

Within the last few weeks frequent dispatches from abroad have told of the successful initial flights of two noteworthy dirigible balloons, the "Republique" of the French government and the "Zeppelin IV." of Count von Zeppelin, which is to be purchased by the German government if it makes a successful long-distance flight of 500 miles from Friedrichshaven to Mayence and back.

The former of these two airships is simply an enlarged dirigible of the "Patrie" type, measuring 61 meters (200 feet) in length and 10.8 meters (34.4 feet) in diameter, and containing 3,700 cubic meters (247,205 cubic feet) of hydrogen gas. The motor is a 60 horsepower, 4-cylinder, Panhard, automobile-type gasoline engine. The two chief improvements in the mechanism and controlling apparatus are the rounding of the tips of the propeller blades and the placing of the vertical rudder at a certain distance back of the tail that projects out beneath the gas bag at the rear. The object of this space is to diminish the pressure upon the rudder of the rapidly displaced air. When filled with pure hydrogen, this new airship can carry a total weight of 1,345 kilogrammes (2,965 pounds) and traverse a distance of 800 kilometers (497 miles) in one flight, and carrying a crew of eight men. Its speed is expected to reach 45 kilometers (28 miles) an hour. The speed of the "Patrie" was as great as this, but its radius of action was only 450 kilometers (280 miles) with a crew of four men. The inflation of the new dirigible required six days. As soon as it was completed, the airship was taken out of its shed, and made to perform evolutions for half an hour at a height of 300 or 400 feet, after which it landed readily. In a subsequent test it flew a distance of some twenty miles in about an hour. A significant fact regarding this new airship, however, is that the government has decided to deflate it and transport it from Chalais-Meudon to the frontier point where it is to be put in service. "La Patrie," it will be remembered, flew successfully from Paris to Verdun, a distance of 147 miles, when it was assigned to duty at this point, and the action of the French authorities in deflating the "Republique" would make it appear that they are afraid to trust their new dirigible to perform a long-distance flight.

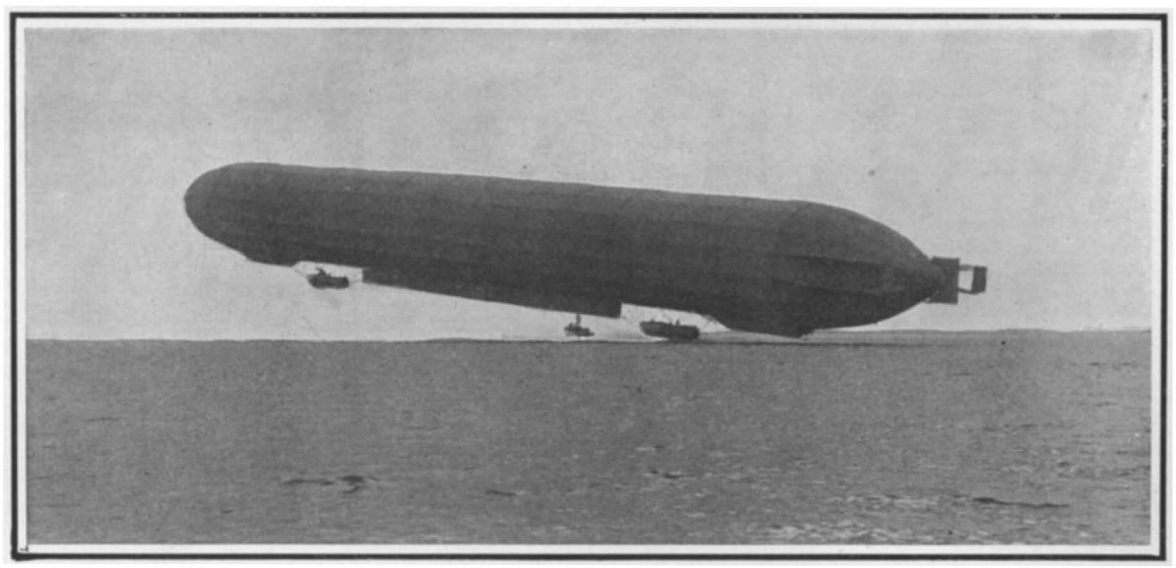
As the "Republique" is the latest representative of the semi-rigid type of dirigible, so the "Zeppelin IV." is of the rigid type, i.e., the type in which the balloon is built upon a rigid framework so that it cannot lose its shape. In addition to this, the envelope itself is constructed of very thin sheet aluminium, which, should it be punctured or torn, can readily be welded by the new Schoop process. The 142-meter (466-foot) balloon is divided into about a dozen compartments,

which contain 13,000 cubic meters (459,090 cubic feet) of gas. The diameter of the balloon is 14 meters (45.8 feet).

The "Zeppelin III." was only 130 meters (426½ feet) in length, with a gas capacity of 10,000 cubic meters (353,150 cubic feet). Its record for speed was about 33 miles an hour, and it remained in the air eight hours and covered 217½ miles.

After a short initial trial on June 21, some changes were made in the rudders. The manageability of the airship was bettered and, after a few subsequent demonstrations, it made a long flight of some 248 miles, remaining in the air 12 hours, as reported in our last issue.

The new airship has separate power plants, each of which consists of a 120-horse-power 4-cylinder engine driving twin propellers. It is fitted with vertical rudders at each end, and at the rear there are slightly inclined, nearly horizontal stabilizing planes placed at an angle with each other of about 30 degrees. The new airship has shown a speed of 34½ miles an hour. The German government expects to have several duplicate air craft built by Krupp, and to use them upon the frontier.

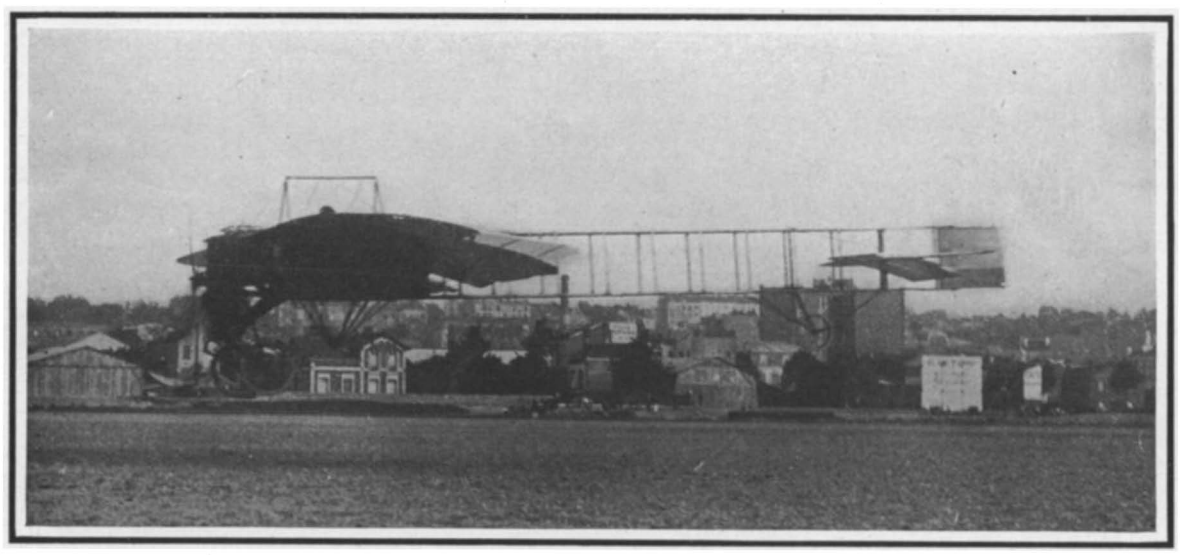


"Zeppelin IV"—The Huge New Airship Which Will Be Acquired by Germany After It Makes a 500-Mile Voyage.

A 120-horse-power engine in each car drives two propellers. Note the stabilizing planes and rudders at the rear. The balloon is made of sheet aluminium laid over a rigid framework.

FIRST SUCCESSFUL FLIGHTS OF BLERIOT'S NO. 8 MONOPLANE.

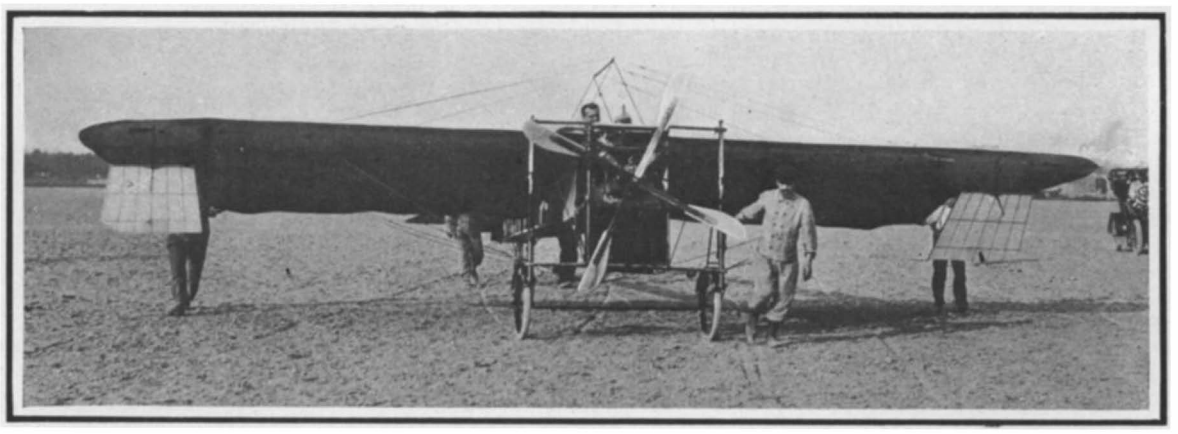
During the past month, M. Louis Bleriot has been experimenting with one of the two large monoplanes which he built last winter, and the first flights have indicated the success of this, the most advanced form of high-speed aeroplane. Two of our illustrations show the machine in flight and its appearance as viewed from the front. As can readily be seen, the monoplane is attached to the front end of a body frame 45.8 feet in length. The rear half of the monoplane, at its outer ends, has movable planes for correcting the transverse stability. The horizontal and vertical rudders are at the rear end of the body frame, while the 50-horse-power Antoinette 8-cylinder motor is placed at the forward end with the 4-bladed propeller on its crankshaft. The blades of the propeller resemble a feather in shape, and they are rather flexible. The aviator sits back of the motor in the body, which is mounted upon two pneumatic-tired wheels in front and one at the rear.



Side View of Bleriot's New Monoplane in Flight.

Note the long uncovered body framework with the single horizontal and vertical rudder at the rear. Also the elaborate bracing of the monoplane above and below.

On June 23, at Issy-les-Moulineaux, M. Bleriot tried his monoplane in a rather strong wind, and succeeded in rising in the air several times for short distances, although the machine did not appear to have sufficient lifting capacity at the rear or to be very readily controlled. After increasing the size of the horizontal rudder, M. Bleriot, on June 29, made an official flight of 600 meters (1,968 feet) before the Aviation Committee of the Aero Club of France, covering three times the distance required to win a medal. The flight was made against the wind in 47 seconds, the machine showing a speed over the ground of about 28 miles an hour. This is the first official record to be made by a monoplane. The machine showed good stability, and traveled very steadily. The photograph shows it descending at a slight angle. Subsequently, M. Bleriot made a circular flight of nearly a kilometer with this machine. The remarkable success that Bleriot had with a Langley-type aeroplane last year causes one to believe that he will yet make some excellent performances with his monoplane, and do much toward the perfecting of this type of flying machine.

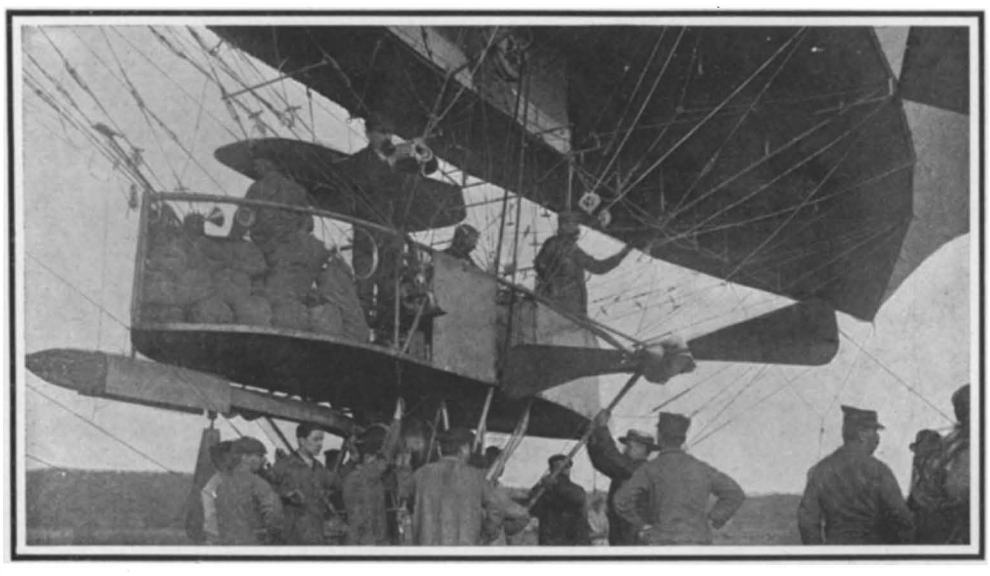


Front View of the New Bleriot No. 8 Monoplane.

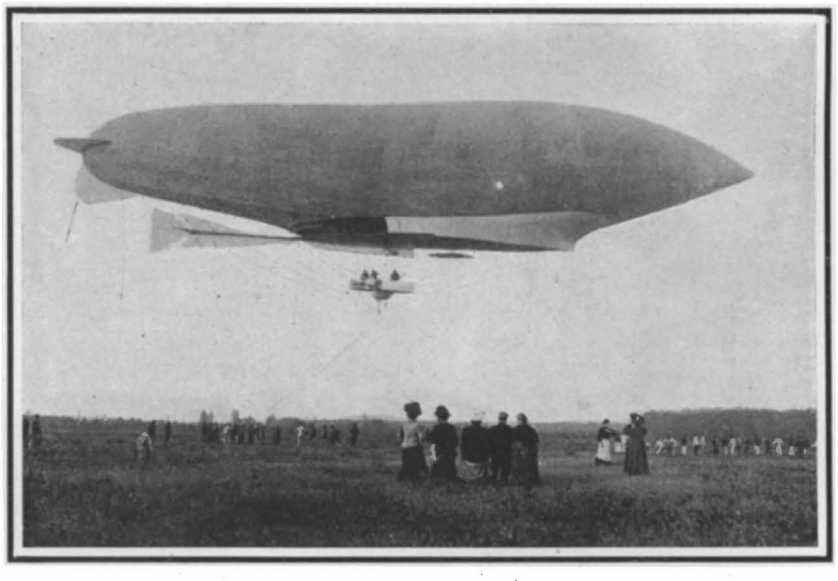
Note the movable wing tips and the 4-bladed propeller with feather-like blades.

FARMAN COMING TO AMERICA AFTER WINNING THE $2,000 ARMENGAUD PRIZE.

Henry Farman recently succeeded in making a 20-minute flight of 18 kilometers (11 miles) and thereby winning the $2,000 Armengaud prize for the first ¼-hour flight above French soil. He has contracted with a St. Louis syndicate to come to America this month, and it is expected that he will begin to make flights at the Brighton Beach race track on July 29. These flights will be made on three successive days, and again, on August 10, four days. They will be held under the auspices of the Aero Club of America, and it is expected that arrangements will be made so that Farman can fly for the Scientific American trophy. Delagrange also is to be brought over by the Aeronautic Society. He is expected about August 20, and he will probably give a series of flights at some place on Long Island.



The Car of the "Republique," Showing One of the Propellers.



The French Government's New Dirigible "Republique," Which Is a Duplicate of the Lost "La Patrie."

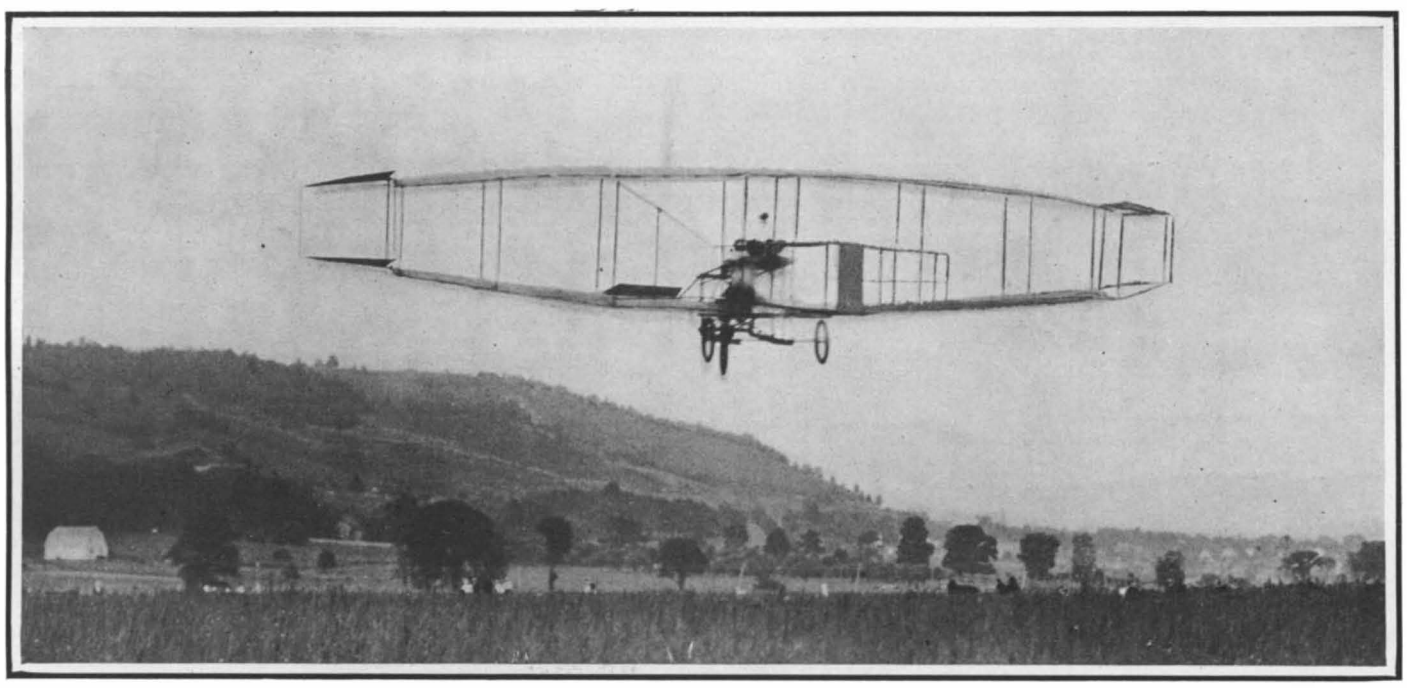
THE LATEST EUROPEAN AEROPLANE AND AIRSHIPS.

THE WINNING FLIGHT OF THE "JUNE BUG" AEROPLANE FOR THE SCIENTIFIC AMERICAN TROPHY.

Nearly a score of Aero Club members and others interested in aviation made the trip to Hammondsport, N. Y., to witness the flight of the Aerial Experiment Association's third aeroplane, the "June Bug," on the Fourth of July, for the SCIENTIFIC AMERICAN trophy. The distance to be covered was a kilometer in a straight line, this being the required distance for the first contest. As Mr. Curtiss was the first aviator to come forward with a practical aeroplane and request a trial since the date of the first competition, September 14, 1907, according to the rules, if he performed the flight set, he would be the first winner. In order to permanently win the cup, he would be obliged to win it three times in separate years. The day at Hammondsport was a typical Fourth of July, there being a number of thunder showers throughout the day, with clearing weather late in the afternoon. Consequently, it was not until 5 P. M. that the aeroplane was taken out of its tent and prepared for the trial. The tail was attached, the motor tested, and, after the photographers had taken numerous pictures, everything was in readiness for the flight. Mr. Charles M. Manley, the late Prof. Langley's assistant and an aviator of note, was the sole representative of the Aero Club's contest committee. In the middle of the afternoon, Mr. Manley measured off the kilometer (3,280 feet), the distance laid out being actually 3,300 feet. The course started on one side of an old half-mile race track, and passed directly through a vineyard and several fields. It was also necessary for the machine to cross several barbed wire fences before it could fly over the finishing post, which was surmounted with a red flag. Mr. Alan R. Hawley, the acting president of the Aero Club of America, was located at the finish, and Mr. Manley took the time at the start at the instant when the machine left the ground. Mr. A. M. Herring and the Aeronautical Editor of the SCIENTIFIC AMERICAN were located within a thousand feet of the finish.

By 6 P. M. everything was ready, and the air was quite calm. The machine was placed at one end of the course, the aviator took his seat, and the motor was started. The instant it was released, the aeroplane shot forward with constantly accelerating velocity. It required only 12 seconds and a distance of about 100 feet before it rose in the air. As he approached the end of the track, Mr. G. H. Curtiss, the aviator, steered his machine to the left, in order to pass around the vineyard. One of our photographs shows the aeroplane making the turn at this point. The machine kept rising, and Mr. Curtiss found difficulty in stopping this, although he directed the horizontal rudder downward to the full extent. Finally, he retarded the ignition of the motor, which caused the machine to slow down and drop. He was unable to rise again, and the machine settled down gently in the high grass about 1,000 feet before it reached the finish.

Upon looking the machine over thoroughly after it had been pushed back to the starting point, it was found that the tail had been attached at too sharp a downward angle. This tended to direct the machine upward, and the horizontal rudder was not sufficient to counteract this. After correcting the inclination of the tail, and after going over the machine thoroughly to make sure everything was in good order, the second attempt was made at 7 P. M. In this flight the machine rose quickly, as before, and following the same course, it sped rapidly on at a height of some 20 feet. As it neared the finish post, it dropped to about 15 feet, and then continued onward, making a wide sweep to the left, and alighting without damage in a rather rough field. The distance traversed was easily a mile, and the time of the flight 1 minute 42 2/5 seconds. This corresponds to an average speed of 35.1 miles an hour; but if the distance of 6,000 feet is taken as the total length of the flight (which distance has been computed by the members of the Association who are most familiar with the course) the speed of the machine was very nearly 40 miles an hour—39.8 to be exact. Thus it will be seen that this aeroplane, with the total weight of 650 pounds including the aviator, and with the expenditure of 25 horse-power, is capable of very nearly the same speed that the Wright brothers claim for their 1,000-pound machine with approximately the same horse-power. The reason that this new aeroplane is able to make such fast speed with so little horse-power as compared with the Farman and Delagrange aeroplanes, is that the tail has been reduced to a much smaller size than those used by the foreign aviators, and that, therefore, there is much less resistance or drag offered by it. The Wright aeroplane has no tail whatever, which is one of the main reasons for its high efficiency.



Copyright 1908 by Levick.

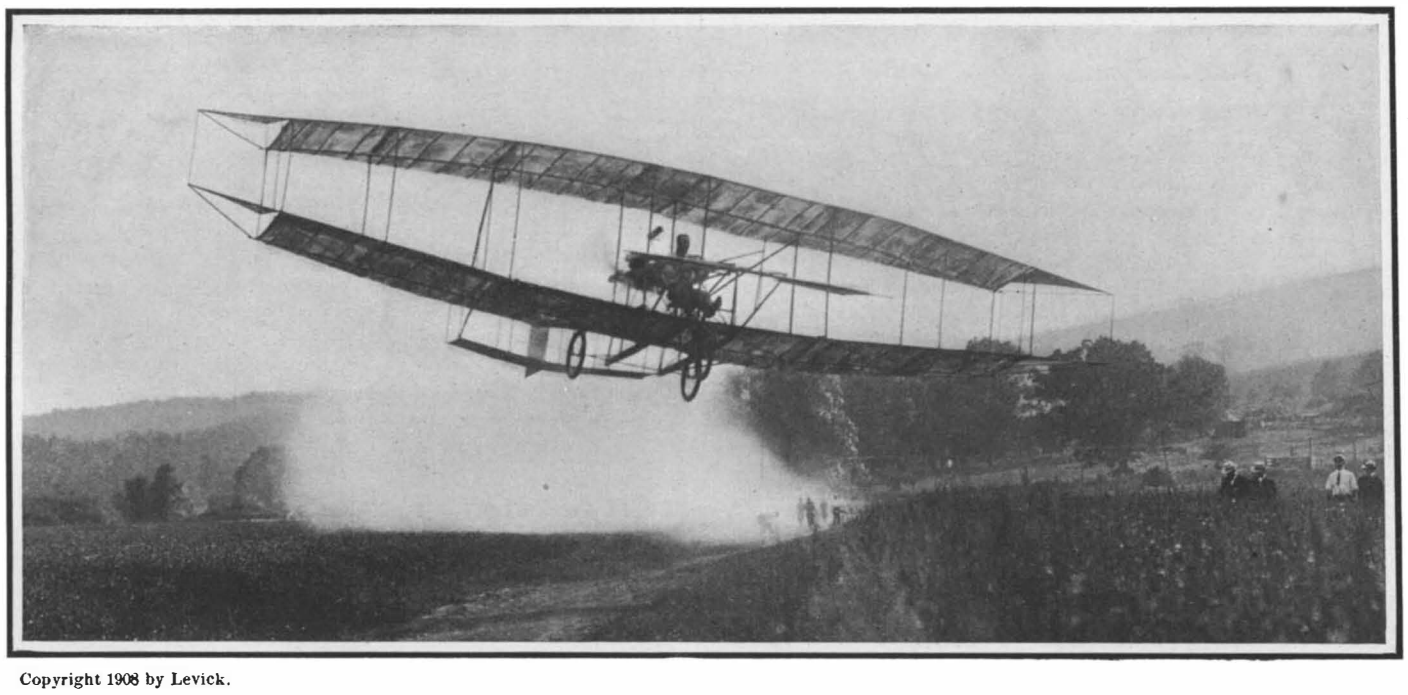
Rear View of the Aeroplane as It Flew Over the Fields.

Note the horizontal wing tips and the downwardly-inclined horizontal rudder in front. The tail and vertical rudder are also outlined against the sky.

The dimensions of the bowed surfaces of the tail are 10 feet long by 27 inches wide. The vertical rudder at the rear edge of the tail is 30 inches square, while the horizontal rudder is 30 inches wide by 8 feet long, with a section of 32 inches removed in the center. The surface of the tail is therefore 22½ square feet; that of the vertical rudder, 6½ square feet; and that of the horizontal rudder, 13 1/3 square feet. The planes themselves have a surface of 370 square feet, and there are 35 square feet of vertical surface in the struts and running gear. The propeller is 6 feet 2 inches in diameter, with a 17-degree pitch. As a 17½-degree pitch is equal to the diameter, the pitch, as can be seen, is slightly less than the diameter. The propeller is mounted direct on the engine crankshaft, which makes 1,200 R. P. M. and develops 25 horse-power. At 38 miles an hour, the aeroplane lifts 26 pounds per horse-power, while the amount lifted per square foot of supporting surface of the main planes is 1¾ pounds. For further particulars regarding this machine, we refer our readers to our issue of July 4.

An interesting point brought out by Mr. Curtiss is that whenever he attempts to drive his machine around the vineyard mentioned, it invariably rises suddenly as if struck by some invisible force. Skilled aviators believe this is due to slight ascending air currents set up by the contour of the land at this point, and the vineyard may have something to do with it.

The next day, late in the afternoon, Mr. Curtiss made another flight, at the end of which he turned practically a complete circle. This flight was 4,500 feet in length, and lasted for 1¼ minutes. The front wheel and several struts of the aeroplane were broken in the descent. This was the sixteenth flight of the "June Bug," and next to the trophy flight of July Fourth, it was the longest that had been made. Mr. Curtiss hopes to make exhibition flights with this aeroplane during the summer, and it is probable that after further practice above a suitable ground, he will be able to duplicate the performances of Delagrange and Farman. We congratulate him at his success in winning our trophy for the first time, and we hope that progress in aviation will be so rapid, that he will stand an excellent chance of winning it again in the future and much more difficult contests to be held.



Copyright 1908 by Levick.

The Aeroplane Tipping as It Made a Sharp Turn After Leaving the Race Track.

Note the downward inclination of the left-hand wing tips for the purpose of righting the machine.

THE WINNING FLIGHT OF THE CURTISS AEROPLANE FOR THE SCIENTIFIC AMERICAN TROPHY.

A Canadian government survey party has been sent to lay out the town site of Fort Churchill, the future metropolis of Hudson Bay. The only settler who is now on the proposed site, which is on the east side of Churchill River, opposite the Hudson Bay post, will be entitled to a free grant of 160 acres. The bill providing for the construction of the Hudson Bay Railway will be introduced into the Dominion Parliament soon, but unless the present deadlock is broken, dissolution must come soon. No progress is being made with legislation at present.

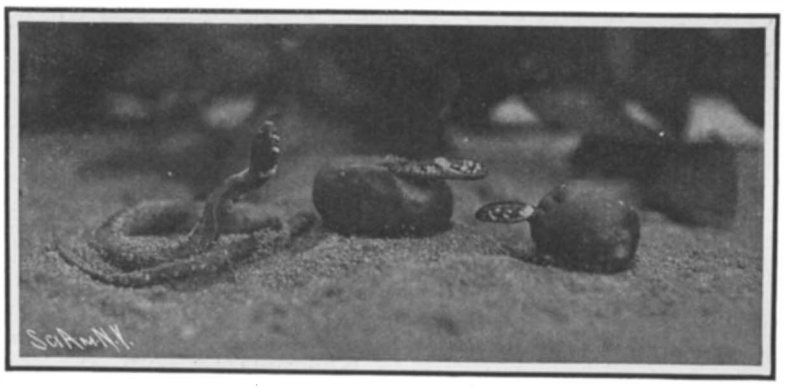
HATCHING SNAKES.

Because of the popular aversion to the serpent family, there is a surprising amount of ignorance about even the simplest of snake habits. It is doubtful if many correct answers could be given to the question whether snakes lay eggs or bear their young alive. As a matter of fact, some species are viviparous and others oviparous. Most of the poisonous snakes, as well as many of our harmless varieties, belong to the former class. In the case of the viviparous species, the eggs remain in the oviduct so long that the young are hatched therein, while in other species the eggs undergo a partial incubation in the oviduct and are hatched soon after being laid. Such snakes are sometimes classed as ovi-viviparous.

The accompanying curious photographs show the young of the European ring snake in the act of emerging from their eggs. This species is closely allied to our common water snake and goes by the scientific name *Tropidonotus natrix*. Curiously enough, all other members of the genus *Tropidonotus* are viviparous, and this species alone lays eggs. Furthermore, according to Gadow's "Amphibia and Reptiles," the new-laid eggs usually show not the slightest visible sign of an embryo, unless oviposition is delayed, when the embryos are more or less developed. The eggs are laid in July or August in a soft bed of loam or decaying vegetation, or in a heap of manure. The older snakes sometimes lay as many as a dozen eggs or more, and they usually stick together so that the entire cluster can be picked up at once. Sometimes, however, if the process of laying is slow, they will be separated, as shown in the photographs. The eggs are about an inch long and of a whitish yellow color. The shell is thin and flexible like parchment. The young hatch in late summer or autumn. Before hatching, they develop a sharp calcareous growth on the tip of the snout known as the egg tooth, with which the shell is slit open. Unlike hatching chicks, which are suddenly dispossessed by the breaking of their brittle shells, the young snakes may make many incisions in the parchment envelopes and take many peeps at the outside world before venturing forth into the new environment. Shortly after hatching, the egg tooth is lost.

At first, the young live on insects and worms, but within a few weeks they are strong enough to attack and devour young frogs. Strangely enough, although the adults are strong swimmers, and spend much time in ponds and streams hunting the fish and frogs on which they subsist, the young are unable to swim and they will soon drown if they fall into the water. The European ring snake, as well as the American water snake, makes an excellent pet; it is perfectly harmless, becomes very tame, and learns to know the difference between friends and strangers. Gadow tells of a pet ring snake that would eat from his hand, crawl up his coat sleeve and coil itself contentedly on his arm.

A Brood of Snakes Emerging from Their Shells.



The Hatching Young of the European Ring Snake.

HATCHING SNAKES.

India's Petroleum Resources.

Consul-General William H. Michael, in writing from Calcutta that the production of petroleum in India, outside of Burma, has not attracted much attention in the commercial world, gives the following general information about these resources:

India proper has her oil fields, and when they have properly developed will without doubt cut a considerable figure in the world's supply of oil produced from crude petroleum. At Kafir Kot this earth oil exudes from brown bituminous sandstone, and is found floating on the surface of springs. It is also found at Ratta Hotar hills, at Jobba, of Karsan, west of Chakratta, nine miles east of Kalabagh; at Dhardur, three miles west of Kabbakhi, in the salt range; at Narsinghpur, also in the salt range; at Jabba, near Nurpur; in the Algod Ravine at Kafir Kot on the Indus River, and in other places. The Bazar of Dehra Ismail Khan, on the hills of the Indus, had it for sale as a medicine long before petroleum was discovered in America, or had been developed in Burma. Petroleum was found many years ago in large quantity at a place called Makoom, not many miles from Jeypur, on the Dehing River. But the leads have remained comparatively undeveloped, and it is as yet unknown to what extent petroleum exists in India.

In Assam the wells near Digboi are the most promising, a company with $1,550,000 capital operating a large refinery there. There are twenty-two wells near Digboi, but five or six have been abandoned, as they were not sunk to a sufficient depth. However, while the deepest well goes down 1,865 feet, it does not yield as much oil as some that are little more than half as deep. The yearly output is now about 63 tons of candles, 573 tons of paraffin wax, and 1,200,000 gallons of kerosene oil. Nearly all the oil is sold locally in Assam, or in the neighboring districts of Bengal.

The government statistics do not show the amount of crude oil, refined oil, or paraffin wax derived from the Indian wells; but, whatever it may be, there is none of it exported from the country unless it be some of the wax. Burma (really a province of India) is the producer and exporter of kerosene oil and the by-products, such as paraffin. In 1906-7 she produced 137,654,000 gallons and exported in that year 55,796,000 gallons, all of it going to Indian ports. The exports of paraffin wax amounted to 60,209 hundredweight, valued at $414,330. The candles made of petroleum products amounted to 5,095,000 pounds, valued at $473,330.

The petroleum deposits of India, including Burma, have scarcely been disturbed, and the magnitude of the possible trade of India in the products of petroleum can hardly be estimated.

The Earth's Temperature.

According to the Engineering and Mining Journal, M. Durnerin has recently communicated to the Société de l'Industrie Minérale the result of his observations on temperature taken during some deep boring operations in Meurthe-et-Moselle. The principal difficulties in the observation of the earth's temperature are currents of underground water, the admission of outside water into the bore-hole, and the heat produced by oxidation which goes on when the hole passes through carboniferous or pyritiferous strata. He found that one degree of temperature was gained every 53 minutes in Triassic sandstone and every 16.5 minutes to 20 minutes in carboniferous conglomerates having a shaly matrix. These results confirm the previous knowledge that the rise in temperature is more rapid in the older strata. It is probable that in the future development of the deep coal measures of Lorraine relatively high temperatures, necessitating, perhaps, the use of artificial cooling apparatus, will be encountered.

Electric Supply at Bilbao.

Three water-power stations at Leizaran, Quintana, and Puentelarra respectively, the first two with a capacity of 4,000 horse-power, and the last 8,000 horse-power, supply the town of Bilbao, on the Bay of Biscay, with electric energy for light and power. The four three-phase Siemens-Schuckert generators at the first-mentioned station are driven by 1,000 horse-power Pelton wheel turbines running at 375 revolutions per minute. They generate at 3,000 volts 50 cycles, and this pressure is raised to the transmission pressure of 30,000 volts by four groups of single-phase transformers, the three in each group of which are connected in star. The second station contains four 1,000 horse-power Francis turbines, and the third contains four 2,000 horse-power units. The stations are respectively 49, 38, and 35 miles distant from Bilbao, in which town a sub-station with a capacity of 6,800 k.w. has been built. The town of Basconia has a 1,700 k.w. sub-station, and smaller sub-stations are situated at St. Sebastian, Vitorio, Arrigorriogo, and Mirando.

The Cause of the Bars at the Mouth of the Mississippi.

BY ORRIN E. DUNLAP.

The great bars at the mouth of the Mississippi River have cost the government untold expense; millions of dollars having been expended to remove them and to prevent their formation. A possible explanation of these bars is suggested by certain discoveries of Edward Goodrich Acheson, of Niagara Falls, N. Y. It was in 1901 that Mr. Acheson entered upon a series of experiments with clay. In the course of his studies he made several experiments on clay with extracts of plants, tannin being one of them. He then caused clay to remain in suspension in the water, making the clay so fine that it would pass through filter paper.

These effects seemed remarkable to him, and his thought was that they might be of considerable use in clay working. He searched available literature, and found only one reference to the use of vegetable matter in clay working. This was in the Bible, where we are told that the Children of Israel, under the instructions of the Egyptians, used straw in making brick. He also learned that the Egyptians substituted stubble for the straw, but as the fiber of straw is very weak, not nearly so valuable as a mechanical bond as many other vegetable fibers that were probably available to the Egyptians, his conclusion was that its use must have been for another reason. Straw contains no tannin, so if the effect he had obtained with tannin was due to tannin only, it was not likely to be produced by the extract of straw. He boiled some oat straw in water, and when he treated clay with this extract, he found it acted like tannin. Having determined this fact, he thought that the Egyptians must certainly have been familiar with this effect.

In the latter part of 1906, while making further experiments, Mr. Acheson thought that tannin might have the same effect on graphite as on clay. He tried it with satisfactory results. Later he found that the effect is obtainable not only with tannin and extract of straw, but also with catechu and the extract of sumac, oak bark, spruce bark, tea leaves, and a solution of dextrine, a list that might be much extended. All these substances, with the exception of straw and dextrine, contain tannic acid; and while early in his experiments he thought tannin was the active agent, in view of his later experiments it seems not to be.

In a paper entitled "Seventeen Years of Experimental Research and Development," read recently before the American Academy of Arts and Sciences in Boston, Mass., he said:

"Some months ago, while crossing the Mississippi River at St. Louis, I looked down from the car window and saw the great muddy stream sweeping to the Gulf; and having fresh in my mind the deflocculation of non-metallic amorphous bodies, it occurred to me that possibly the matter suspended in the water was in a deflocculated condition, and I remembered that I had been told that nearly if not quite all of this muddy water came out of the Missouri River from the great plains of the Middle West, and further, that the water did not clear during its entire course of some hundreds of miles, but that none of the muddy water was found at any great distance from its entry into the salt waters of the Gulf, the suspended material being deposited at the mouth of the river, there forming the great bars of the Mississippi. I also recalled the formation of the great delta of the Nile, and I felt quite convinced, without an experiment, that the material was deflocculated and in a colloidal condition, and became flocculated and settled on coming into contact with the electrolyte—salt water."

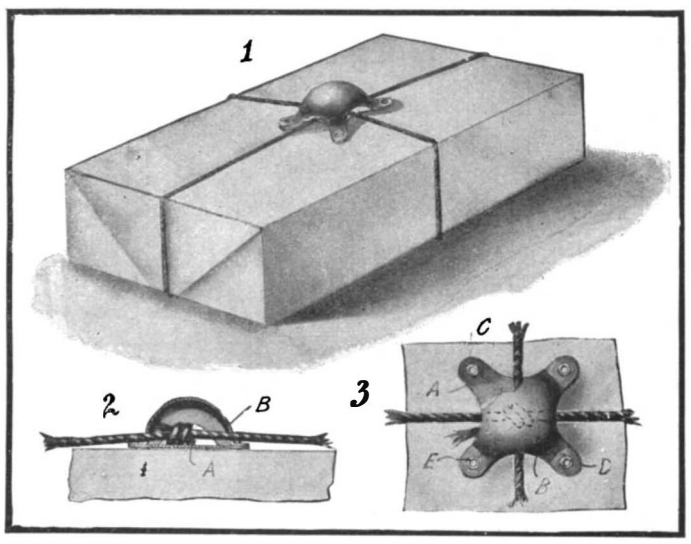
In his laboratory Mr. Acheson has a bottle of water carrying clay in suspension, the clay having been macerated with a little water and extract of straw in an amount less than one per cent of the weight of the clay. By filling two test tubes with the contents of the bottle, and after adding a little common salt (chloride of sodium) to one of them, it is found that within a short time the one to which the salt has been added is slowly clearing from the top downward. Within a few hours it becomes perfectly clear, all the clay being deposited at the bottom of the tube. This experiment seems to explain why the muddy waters of the Mississippi, Nile, and other rivers precipitate their suspended solid matter when they come in contact with salt water, showing how great bars and deltas are formed.

The railroad traversing the Andes, connecting Guayaquil, the principal port of Ecuador, with Quito, the capital of the republic, is completed. The first train was run over the line June 25, on which occasion there was a series of festivities throughout the republic.

Patent Department

SEAL AND PROTECTOR FOR KNOTS

The usual method of protecting a package by means of sealing wax is not applicable to all classes of parcels. There has been a demand for something which could be applied to larger packages and bundles, and which could be more simply affixed. With a view to meeting this requirement the seal and protector shown in the accompanying engraving has been invented. It consists of a device which may be secured over the knot with which the package is fastened, and in such a manner that it will be impossible to untie the knot without breaking or damaging the seal. The device is very simple, and consists of but two members, *A* and *B*. The member *A* is a plate formed with four projecting arms, and the member *B* is dome-shaped, and has four arms adapted to fit over the arms *C*. In practice, the package should be tied with a knot joining four intersecting strands. It makes no difference what the form of the package is, or what its size. The plate *A* is passed under the knot, and the dome-shaped member *B* is placed over the knot, with the arms *D* located between the strands, and in contact with the arms *C*. The arms of the two members are then joined together with metal fasteners of any well-known type. It will then be impossible to reach the knot with which the package is tied without breaking or prying open at least one arm of the seal, and if the fastener on this side is broken, it will be impossible to insert a new one without the fact being evident to the person receiving the package. The inventors of this unique seal are Messrs. M. Dessauer and S. Baruch, of 175 Wooster Street, New York, N. Y.



SEAL AND PROTECTOR FOR KNOTS.

Battery for Converting the Energy of Combustible Substances into Electric Current.

BY H. M. NICHOLS.

An interesting method of directly converting the energy of carbon and other combustible substances into electricity is given in a recently issued patent. The inventor utilizes the energy obtained when sulphurous acid (H_2SO_3) is oxidized to sulphuric acid (H_2SO_4). He also utilizes the oxygen of the air for his depolarizing element. His battery consists of two carbon plates surrounded with granulated carbon and separated by a porous non-conducting plate of burnt clay or similar material. The two carbon plates act simply as inactive conductors for the oxidizing and reducing electrodes. The electrolyte used is sulphuric acid.

At the positive electrode nitric acid is added, forming nitrosyl-sulphuric acid. Air is forced through the compartment holding the positive electrode. The nitrosyl-sulphuric acid absorbs oxygen from the air and this oxygen serves as the depolarizing element of the cell. Sulphurous acid gas is forced through the negative compartment and is oxidized according to the following equation: $H_2SO_4 + H_2SO_3 + H_2O = 2H_2SO_4 + 2H$. Sulphuric acid + sulphurous acid + water = sulphuric acid + free hydrogen. The hydrogen passes through the electrolyte to the positive element of the battery as is the case in every electrolytic cell. Here it is oxidized to water by the oxygen absorbed from air.

It is thus seen that the final result is a union of sulphurous acid, oxygen, and air to form sulphuric acid, the other elements remaining unchanged. The energy of this reaction is utilized as electricity.

It is stated that the voltage of this cell varies from three-tenths to five-tenths volts, depending on the degree of concentration of the sulphuric acid.

The sulphuric acid obtained by the action of the battery is reduced to sulphurous acid by heating it with a combustible substance such as coal, coke, wood, etc. This completes the cycle of obtaining electric energy from combustible substances, by chemical reactions only, without first converting the chemical energy into mechanical energy, as is done, for instance, when a steam plant is used to generate electricity.

It is stated in the patent specification that "it is evidently much cheaper to start large batteries of the kind herein described by employing other crude material for the production of sulphurous acid than by means of a reducing substance. Such methods as the burning of sulphur, the roasting of sulphur ores, the reduction of sulphates with carbon, etc., may be employed to produce the sulphurous acid required by the battery."

With our present method of generating electricity from coal only 5 to 10 per cent of the total energy of the coal is utilized. This new battery should utilize a much larger percentage of the total available energy of coal. The principal drawback at present to the commercial development of this battery is the fact that the apparatus is very bulky and a very large plant would be required to produce a small amount of power.

HOME-MADE ROTARY PRINTING PRESS BUILT OF JUNK.

BY C. M. FOSTER.

The design and construction of a good-sized rotary printing press is no small task for an amateur mechanic to undertake, even when provided with all the facilities of the up-to-date machine shop. But to build a machine out of junk with such chance tools as one could pick up or borrow, seems next to impossible. Such a feat has just been accomplished by the Rev. J. P. Brooks, a Baptist minister of Glasgow, Ky. A photograph of the press is shown herewith. In its make-up one can trace the parts of mowers, binders, reapers, threshing machines, corn drills, oil-well machines, etc., collected from the surrounding country. This varied assortment of junk has been assembled into a press capable of printing a sixteen-page daily paper for the city of Glasgow.

As a boy, Mr. Brooks was fascinated with the printing art, and he early entered into the printing business, using a small hand machine at first, and later a somewhat more pretentious second-hand press. But this press was not equal to his requirements, and lacking the money to buy an up-to-date machine, his only alternative was to build one himself. His vocation as a minister called him to different sections of the surrounding country, and wherever he went he kept his eyes open for parts of machinery that might be used in his press. Friends loaned him the use of their tools; some of the lathe work had to be done in a neighboring machine shop, and some of it was done by Mr. Brooks himself on a home-made lathe. After much filing, chiseling, cutting, and drilling, the press began to take form. But more than the usual share of ill fortune fell to the lot of this amateur mechanic. The building in which the press was constructed burned down and the machine that was just about completed was destroyed. A second machine was constructed out of the ruins of the first, but no sooner was it completed, than its builder was kicked by a horse and laid up with a broken leg in a neighboring county. To pay his expenses, the press was sold to a junkman. Mr. Brooks's third and finally successful attempt is shown in the photograph. It represents four years of hard work, and in it are some of the parts of the original machine recovered from the junkman. The press has a wooden frame. In fact, wood enters into the construction of the machine wherever consistent with strength and durability. Hampered by lack of tools and the necessary castings, many makeshifts had to be resorted to. The six cylinders of the press are made of thoroughly seasoned oak. The surface of the wood was driven full of nails, and then turned down in a lathe.

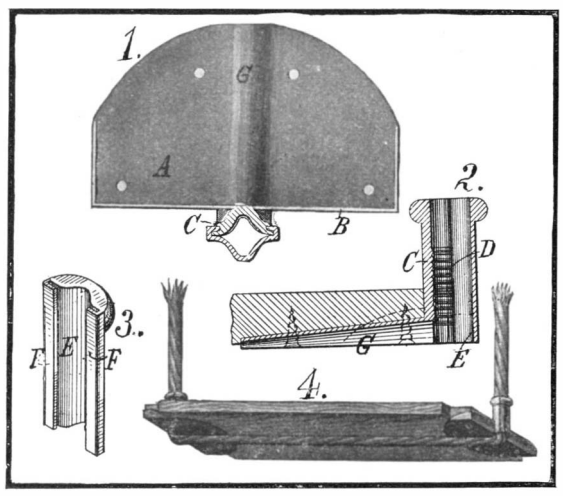
The press can hardly be said to conform to any standard type, as the inventor has embodied many of his own ideas in its construction. It affords an excellent example of what the determination and perseverance of an inventor will accomplish, despite the greatest obstacles and discouragements.

Electrical Teredo-Proof Wooden Piles.

A wharf builder of San Francisco was rebuilding an old wharf in which the piles were badly eaten by borers, when he came upon one that was perfectly sound. A careful investigation as to the cause of this singular exception revealed the fact that the pile had been used to support a live wire which was grounded at this point. Taking a clew from this fact, the wharf builder decided to experiment with electricity in wooden piles, and he discovered that the teredo would not attempt to bore into a pile in which even a light current of electricity was maintained. A patent has recently been granted to Mr. Thomas Prudden, the discoverer of this idea, on a system he has developed for electrically protecting wooden piles from the ravages of the teredo.

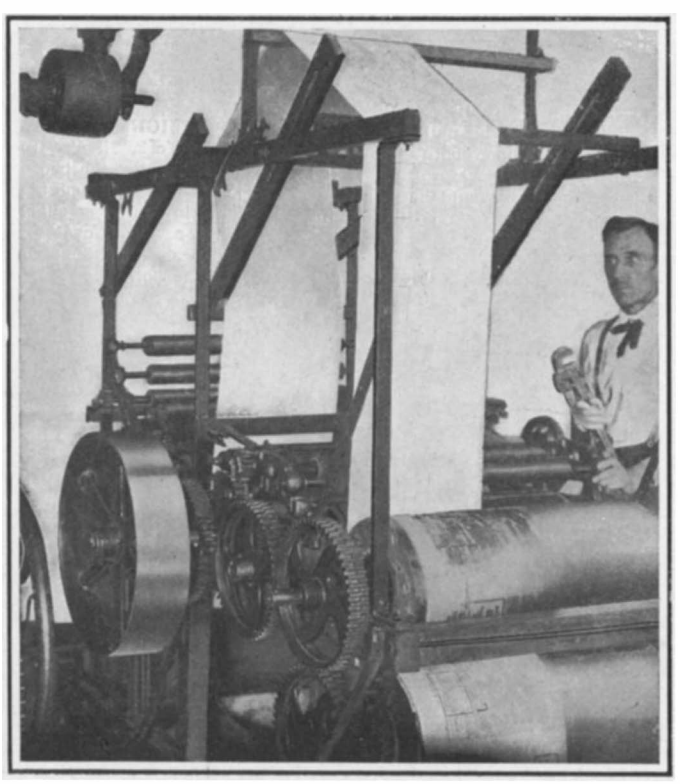
ROPE BRACKET FOR SWING SEATS.

A patent has recently been secured on a bracket for securing the seat of a swing to the rope. A special clamping device is provided, whereby the seat may be released from the rope quite readily. The clamp is also so arranged that the seat may be attached to the rope at any point in its length, thereby permitting of the adjustment of the height of the swing without necessitating the untying of one or the other of the ends of the rope. As indicated in Fig. 1, the bracket consists of a plate *A*, formed with a flange on three sides. The flanges are adapted to engage the end of the swing seat, as shown in Fig. 4. Projecting upward from the outer side of the plate is a socket member *C*. This is formed with corrugations *D*. A groove is cut in the opposite sides of the socket member, to receive the flanges *F* of a binding member *E*. In practice, the rope is set in the recess of the socket member *C*, and the binding member *E* is then brought into engagement with the grooves in member *C*, and jammed down, forcing the rope against the corrugations *D*. The bracket is thus clamped to the rope securely. In order to prevent too sharp a bend of the rope under the bracket, the latter is formed with a groove *G*, which is inclined, as indicated in Fig. 2. It will be apparent from the above description of the construction of the clamp, that the swing seat may be mounted and secured at any desired point on the rope. The inventor of this rope bracket is Mr. O. M. Stalson, Eau Claire, Wis., R. R. No. 1.



ROPE BRACKET FOR SWING SEATS.

M. Kluytmans, the inventor of the divided dirigible balloon of Baron de Marcay, which we illustrated a short time ago, has received an order from the Russian government for a combination aeroplane and dirigible balloon. The gas bag will be of the divided type, since the inventor's small model dirigible in a recent test made a very good performance. Russia is also building a five-man dirigible, which it is expected will be completed by September.



HOME-MADE ROTARY PRINTING PRESS BUILT OF JUNK.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

SPARKING PLUG.—E. MOONEN, 33 Rue Dautancourt, and A. DUMAIRE, 64 Rue Lamark, Paris, France. The invention relates to improvements in plugs for explosion motors, by means of which it is possible to adjust the distance between the spark-producing surfaces without it being necessary, as in most known systems, to displace longitudinally the central rod, thus partly dismounting the plug. One object is to produce a plug having large surfaces between the sparking parts, thus diminishing the wear of the surfaces and lengthening the life of the plug.

BINDING-POST.—N. SOHL, New York, N. Y. In this case the improvement relates to binding posts adapted to be used with electric wires and to afford a firm and positive connection therewith. Although adapted for general use it is especially designed to be used where vibrations or jars would loosen or disturb the screws, bolts, or nuts ordinarily employed.

Of General Interest.

FEED FOR GRAIN, ORE, AND MINERAL SEPARATORS. — W. GRAY, Lincoln, Neb. Former difficulties have been overcome by this invention which by delivering the materials on a horizontal plane or directly across a vertical spout and at right angles to the ascending air current, they are spread out in a thinner sheet so that the air current acts therein more effectively, or in other words, forces upward and separates the lighter materials from the heavier in a more perfect manner than is practicable when the materials are discharged in a downward direction.

VULCANIZER.—W. D. GRATAMA, Rijswijk, Netherlands. The invention pertains to improvements in vulcanizers for vulcanizing endless or very long strips, belts, rods or the like of gutta-percha, India rubber, etc., also insulating wires or the like, whereby it is rendered possible to vulcanize these articles not by means of heat alone as hitherto, but also under pressure, so that a better quality of the goods is insured.

DEVICE FOR MAKING WIRE HAT-FRAMES.—B. BELLE, New York, N. Y. The aim of this invention is to produce a device which will enable a wire frame to be formed with facility thereupon, and to construct the device with a view to securing accuracy and symmetry in forming the frame. The device is adaptable to changes in style and to arrange the parts so as to enable the wire frame to be readily released.

Hardware.

COMBINED MEASURE, FUNNEL, AND FILTER.—P. MACA. MACKASKIE, Central, Nev. Details are provided in this case for the construction for a funnel, a coniform filter, and a controlling valve for closing the spout of the funnel, whereby the funnel shell is adapted for use as a liquid measure, parts being so arranged that the contents of the funnel must pass through the filter before they are discharged through the funnel spout.

SAFETY-RAZOR.—J. C. BOYLE, Calgary, Alberta, Canada. With the ordinary unguarded razor the sliding cut can be effected only by the most skillful operators, such as barbers. With this safety razor the sliding cut is automatically and positively effected and requires no skill or experience on the part of the user. As the blade itself is movable to produce the sliding cut, it is unnecessary to manipulate the razor in a peculiar fashion to effect this.

LEVEL.—H. W. BROWN, Waterbury, Conn. More particularly the invention relates to levels used by masons, builders, and others, in architectural and engineering work. An object is to provide a simple and inexpensive instrument, by means of which the elevation and alinement of objects at different points and in different directions can be ascertained.

WRENCH.—F. M. DAMON, Seattle, Wash. By the construction of this wrench, the connection of its jaws will dispose it directly over the saw teeth, and the pull on the lever will exert draft force upon both jaws and at the center of the heel plate, so that there is no lateral strain which would have a tendency to break the coupling pin and thus endanger the hands of the user of the wrench.

Household Utilities.

ADJUSTABLE SHADE-SUPPORT.—T. C. HOWLAND, Long Branch, N. J. The shade support is slidably mounted in a bracket, the latter having its opposite side edges turned toward each other outwardly to form a guideway, and the support consisting of an arm and a foot, with the opposite side edges of the foot turned inwardly to fit and conform to the guideway, and the arm passing out between the opposed edges of the bracket.

MATTRESS ATTACHMENT. — C. UHDEN and I. OWEN, Spokane, Wash. The attachment is particularly useful as a bolster in connection with a mattress body. An object of the invention is to provide a strong and inexpensive bolster adapted to be secured removably to a mattress and serving as a protector for the feet, and for holding the covers of a bed in position at the foot thereof.

Machines and Mechanical Devices.

ENGINE-STARTER.—C. B. LAZENBY, Chicago, Ill. The invention refers more particularly to a starter especially adapted for use upon a motor vehicle, and so designed as to be readily connected to the steering mechanism and operated therefrom. It involves means whereby the starting mechanism and steering gear are automatically detached from operative engagement with the engine after the starting of the engine is accomplished.

MECHANICAL MOVEMENT.—F. CRATER, Parsons, Kan. This mechanical movement is more especially designed for converting reciprocating motion into continuous rotary motion in a very simple and effective manner. It can be readily used for various purposes, that is, may be used in ratchet drills and for operating blacksmith forges and other machinery.

ANTIFRICTION WHEEL-BEARING.—W. J. BREWER, Trenton, N. J. The invention is designed to improve a form of roller bearing in which the journals of the roller bearings project through opposite sides of the boxes or casings of the wheel or pulley to which the invention is applied and project also through plates which are arranged on the sides of the casing at the center through which plates the axle passes, and which are arranged to practically afford supporting means for the axle.

VALVE.—C. ORENSTEIN and H. I. DERBY, Topeka, Kan. As certain bodies of a valve are very expensive to cast and finish, by reason of the number of ports, bolt openings, etc., it is desirable to relieve them of all wear possible. This invention does this by providing the seat of the valve-head, afforded by the valve-body, with a detachable wear-plate, having holes to register with the respective ports and bolt openings, and is made fluid-tight with the body by an intervening gasket.

RECORDER FOR MEASURING LUMBER.—C. F. MCLAUGHLIN, Neame, La. The invention pertains to recording mechanism and more particularly to a device suitable for use as an attachment for planing mills and woodworking machines of various kinds; the purpose being to record automatically the quantity of lumber operated upon by each machine, and to indicate losses of time occurring in the machines to which the attachment relates.

REMOVABLE WIRE CALK.—G. S. MEYER, Newburgh, N. Y. The invention relates more particularly to means adapted to be readily secured to the shoe and hoof, and presenting a plurality of projections serving to prevent the horse from slipping. The object is to provide a mechanism formed solely of wire and adapted to be attached when desired. The calks and connections are very cheap to manufacture. The calks are firmly held in place, no special tools of any kind being required.

Prime Movers and Their Accessories.

LUBRICATOR WITH SUPPLEMENTARY DELIVERIES.—J. N. HOCHGESAND, 200 Quai Jemmapes, Paris, France. The present invention has reference to an arrangement for regulating delivery, applicable more particularly to lubricators, and enabling the position of the rod regulating the flow to be known at a distance or at night by the touch. It further relates to the method of mounting the needle valve; this is mounted upon a spiral spring attached to the end of the regulating rod. By this means it is always applied exactly to its seat.

Railways and Their Accessories.

CAR-RELEASE.—A. F. BIAVATI, Freeport, N. Y. The observation wheel and annular rails in position, a car is moved into the wheel and the overhangs of the car roof engage rollers, the car being thus lifted off the track and hanging from the rollers. Frame plates rest by aid of flanged rollers upon the rails carried by the wheel. Means permit another car to be connected with the wheel. Each time a car arriving approximately at track level it is let down upon the inclined track engaging the rails, and being released as the wheel turns until its weight is supported by the rails. It then glides down the incline, being ultimately brought back upon the track.

Designs.

DESIGN FOR A BOTTLE.—E. J. PROBST, New York, N. Y. In this ornamental design for a bottle, the body thereof is formed with a small blunted point at the top and swelling out into an egg shape it abruptly rounds out into a nearly oval form. Two small tapering shapes carry the structure to a small stopper at the bottom.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

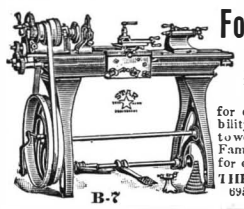
INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending July 7, 1908.

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Absorbing composition and making same, J. F. May 892,754
Acetylene generator, G. Rocco 892,893
Acid, producing concentrated nitric, B. F. Halvorsen 892,516
Adjustable stand, M. W. Hearn 892,422
Adjusting and locking device, F. H. Richards 892,623
Advertising device, F. X. Robert 892,499
Aerial navigation, Moore & Barrow 892,606
Air brake pressure adjuster, automatic, U. S. Smith 892,561
Air compressor, hydraulic, C. H. Taylor 892,772
Air sander, W. Hughes 892,426
Amalgam for use in coating glass to form mirrors, J. Laval 892,435
Amusement device, trick, F. I. Judson 892,482
Atomizer and powder distributer, combined, W. J. Barber 892,703
Automobiles and the like, cooler for, J. D. Maxwell 892,864
Automobiles, electric lighting system for, F. L. Parrill 892,445
Automobiles, glass front for, J. Wieden 892,481
Automobiles, radiator for, A. L. F. Holzerland 892,832
Axle, R. V. Lee 892,436
Back spacing device, J. W. Paul 892,614
Bag lock, R. Masters 892,534
Bars, work board for, E. B. Hogan 892,831
Bath tub seat, J. P. Eustis 892,657
Battery charging apparatus, F. G. Duryee 892,655
Battery indicator, R. N. Chamberlain 892,500
Bearing, roller, Gillette & Dake 892,416
Bearing, roller, E. L. Sharpneck 892,691
Bearing, roller, E. Moonen 892,866
Bed with commode attachment, invalid, W. C. Feely 892,817
Beer and like liquids, apparatus for cooling, H. G. Miller 892,674
Belt, metallic, H. L. Canne 892,807
Belt stretcher, R. I. Henderson 892,959
Bicycle crank, A. Cataldo 892,935
Bin, W. C. & F. W. Hobbs 892,830
Bit. See Check bit.
Blackboard for partitions, H. J. Hanson 892,954
Blacking machine, heel, O. J. Lear 892,530
Blankets, attachment for stable, C. A. Noble 892,815
Boats, hand operated mechanism for row, S. G. Hallman 892,418
Boiler cleaner, O. S. & L. A. Platt 892,617
Boiler feed pipe cleaner, J. H. Watters 892,446
Bolting cloth cleaner, J. P. Guidinger 892,590
Book tooling and lettering press, M. Kalaba 892,847
Boots and shoes, means for attaching pads to, W. Plowright 892,884
Boots and shoes or the like, mechanical hammering device for use in the manufacture of, G. Kion, reissue 12,825
Boring tool holder, adjustable, W. J. Roman 892,894
Bottle and jar stopper, C. E. R. Christensen 892,403
Bottle filling machine, Williams & Falls 892,483
Bottle, non-refillable, C. B. Davis 892,939
Bottle receiving and handling device, T. F. Lamb 892,433
Box fastener, H. A. Voelkner 892,471
Bracelet, S. B. Kent, reissue 12,824
Brake shoe, C. D. Pettis 892,883
Brick molding machine, H. S. Bowler 892,574
Brooder, H. H. Charles 892,650
Brooder heating appliance, R. F. Brooks 892,396
Broom support, L. Jorgensen 892,525
Brush, F. D. Wolfgram 892,485
Bucket dump, automatic, N. J. Sweeney 892,914
Buckle, R. London 892,862
Buckle, W. F. Aston 892,925
Buckle, W. Lebowitz 892,963
Buckle attachment, belt, A. A. Felix 892,949
Button fastener, F. E. Warner 892,784
Cake cutting guide and gage, F. Rexer 892,552
Calculating machine, T. Bauerle 892,704
Calculator, interest, M. Katz 892,526
Camera, magazine, W. C. Seckler 892,903
Can cap hemming machine, Krummel & Taliaferro 892,743
Canning apparatus, W. W. Wilson 892,638
Car, convertible, B. Mazanek 892,671
Car or train safety apparatus, J. P. Coleman 892,811
Cars and other vehicles, spring wheel for motor, E. Rodriguez 892,452
Cars or vehicles along a railway, apparatus for governing the passage of, J. D. Taylor 892,770
Carbureter, E. N. Broderick 892,499
Carbureter, G. H. Holgate 892,726
Card shuffling device, B. F. Bellows 892,389
Card support, W. L. Keplinger 892,860
Carpenter's gage, B. A. Vaughn 892,780
Carriage foot brake, C. Strohkorb 892,769
Carry all, S. D. Wilson 892,969
Cartridge safety cover, F. C. Mosier 892,757
Carving machine, M. A. Cuming, reissue 12,827
Celluloid like substance, Schraube & Laudien 892,899
Cement block machine, W. S. Colvin 892,583
Centrifugal separator, E. A. Forsberg 892,513
Chain, J. Sevcik 892,965
Check bit, safety, C. H. Lawton 892,748
Check row attachment, W. B. Hampton 892,953
Chin support, C. J. Lewis 892,860
Chute, conveyer, J. Ream 892,550
Cigarette holder, O. A. Day 892,812
Circuit closer, time limit, W. W. Brown 892,576
Cleaning and polishing machine, R. G. Carpenter 892,934
Clevis, Wiese & Schneckloth 892,787
Clevis, R. H. Sullivan 892,966
Closure, P. J. Sweeney 892,466
Cloth cutting machine, A. Spielman 892,460
Clutch, T. G. Morse 892,868
Coal screen, F. S. Converse 892,406
Cock, automatic supply, F. B. Easton 892,815
Coffee percolator and strainer, R. Jorgensen 892,846
Coin package wrapper, R. B. Ware 892,474
Coil parceling apparatus, W. C. Olland 892,878
Collar, horse, J. H. Crouse 892,711
Collar shaping device, J. J. Meehan 892,604
Collar supporter, N. Illoway 892,729
Concrete buildings, apparatus for use in construction of, N. C. Newerf 892,543
Concrete mixer, J. Carlen 892,399
Concrete mixer and conveyer, J. B. Thies 892,630
Concrete mixing apparatus, A. G. Axelson 892,496
Concrete post, reinforced, I. L. Graham 892,826
Control system, H. D. James 892,841
Controller, E. W. Stull 892,464
Cooking utensil, A. T. Lueckenbach 892,751
Cork extractor, C. J. Gromer 892,720
Corsets, abdominal strap for apparel, S. Kops 892,742
Cotton handling apparatus, A. A. Sullivan 892,912
Couch, S. E. Condon 892,405
Coupling gage, G. E. Starbird 892,563
Crane hook attachment, Davis & Handley 892,940
Cream separator, centrifugal, P. T. Sundberg 892,913
Cross tie and rail fastener, metallic, G. Williams 892,789
Crusher. See Rock and ore crusher.
Cultivator, lister, E. M. Swanson 892,465
Cultivators, chopper attachment for, C. A. Snider 892,906
Curtain fastener, F. Marggraff 892,439
Cutter bar, J. W. Chesrown 892,402
Decoy support, H. A. Kricke 892,528
Desk, V. Kilpatrick 892,851
Diabolo bobbin, D. D. Field 892,951
Dispensing can, S. Ellery 892,716
Display rack, W. Freeman 892,413
Distribution system, H. L. Van Valkenburg 892,470
Ditching machines, conveyer for, A. J. Koob 892,740
Door fastening, sliding, J. J. Wells 892,785
Door securer, C. W. Stewart 892,462
Doors of dumb waiters, locking device for the well, A. E. Fischer 892,819
Downdraft furnace, O. D. Orvis 892,613
Draft appliance, D. S. Jenkins 892,843
Drilling machine, M. E. Spears 892,459
Drilling machine, J. P. Karns 892,849
Driving gear, Buettner & Shelburne 892,932
Driving mechanism, G. W. Morris 892,539
Drums and the like, skin substitute for heads of, C. Poland 892,885
Drying machine, rotary, W. M. Schwartz 892,901
Dust absorbing compound, F. D. Wolfgram 892,484
Dye and making same, yellow sulphur, W. Schmidt 892,455
Dye, red vat, Schirmacher & Landers 892,897
Dyeing, H. Toepfer, reissue 12,826
Dyeing and bleaching apparatus, Schmitt & Handschin 892,898
Educational device, J. A. De Vilbiss 892,715
Egg beater, E. W. Ladd 892,856
Egg tester, J. W. Billings 892,705
Electric battery, W. Morrison 892,608
Electric snap switch, W. S. Mayer 892,670
Electric switch, H. H. McIntire 892,872
Electric wires, swivel joint for, H. A. Black 892,928
Electrical connection plug, W. S. Mayer 892,755
Electrotherapeutic generator, S. N. Metzler 892,441
Embalming liquid, concentrated, C. B. Dolge 892,654
Embroidery hoop, F. E. Kohler 892,961
End gate fastener, M. R. Cole 892,936
Engine, L. S. Burbank 892,804
Engine starter, G. L. Odenbrett 892,544
Engine starting device, explosive, L. S. Nash 892,609
Envelop, C. S. Northrop 892,611
Envelop, D. & G. La Tremouille 892,858
Equalizing device, A. Lawson 892,747
Excavating machine, W. N. Morrill 896,538
Excavator, C. G. Rollenhagen 892,453
Excavator, J. G. Fairbanks 892,508
Excavators, chain drive for, C. H. Caleson 892,806
Explosive engine, C. H. Baldwin 892,795
Explosive engine, compound, J. A. Williams 892,790
Fabrics, fringed edging for, M. O. Rehfuss 892,889
Facial defects, appliance for removing, M. B. Smith 892,560
Fan, J. C. Morgan 892,867
Fan, distributing, Roby & Pattison 892,553
Fare register, J. F. Ohmer 892,877
Fashion plate frame and display stand for merchandise, combination, A. K. Brauer 892,575
Fastening device, A. V. Bryce 892,972
Faucet, G. F. Barron 892,641
Felly joint, J. A. Cain 892,648
Fence post attachment, L. B. Harmon 892,420
File, F. C. Hayes 892,957
Filter, G. Knock 892,739
Filtering well, G. Chenot 892,581
Firearm, repeating, L. L. Hepburn, reissue 12,823
Fish hook releaser, O. F. Immell 892,730
Flashing apparatus, sign, G. Wesley 892,477
Flexible joint, M. W. Brown 892,930
Floor dressing machine, E. W. Whitmore 892,634
Foot appliance, E. S. Farra 892,412
Foot support and protector, F. Dahlmann 892,652
Fruit and vegetable pitter, D. H. Mosteller 892,676
Fruit juice and preserving same, J. A. Froberg 892,415
Fruit packing box, A. L. Woodill 892,570
Frying pan, L. I. Toothaker 892,467
Furnace cover operating mechanism, pit, D. L. Mekeel 892,865
Furnace draft regulator, boiler, G. Steele 892,565
Furnaces, radiator for hot air, F. Kernan 892,737
Furniture, apartment wall, C. R. Jordan 892,668
Furs, fastener for, A. Klein 892,852
Gambrel, hog, J. A. Gratton 892,719
Game board, J. Massoth 892,669
Gape worm extractor, S. M. Walker 892,472
Garbage plant, Draine & Shingledecker 892,942
Garment holder, C. J. Mellings 892,752
Garment hook, E. W. Ladd 892,855
Garment stretcher, F. X. Faller 892,510
Gas analysis, apparatus for, C. A. Hartung 892,955
Gas, apparatus for manufacturing water, P. Plantinga 892,548
Gas fixture, extensible, L. R. Yansky 892,639
Gas generator, acetylene, C. W. Beck 892,573
Gas generator, acetylene, Wry & Jones 892,924
Gas producer, W. B. Hughes 892,427
Gas producers, ash extractor for, J. A. Smitmans 892,767
Gate and door fastening device, S. B. Scholz 892,456
Gear cutting apparatus, J. F. A. Mill 892,442
Gear cutting machine, N. A. Christensen 892,810
Gear, speed changing, C. H. Lee 892,859
Gear, transmission, F. E. Landberg 892,744
Gearing, T. J. Winans 892,923
Gin and transport, combination, H. F. James 892,733
Glass mold, B. C. Gilligan 892,589
Grading or separating machine, A. S. Goss 892,825
Grain cleaner and drier, J. S. Coon 892,502
Grain meter, M. Zimmerman 892,492
Grain separator, G. W. Flewell 892,512
Grain shock elevator, J. James 892,960
Granular or pulverulent material, receptacle for, A. J. Blood 892,392
Grate bar, A. C. Lippincott 892,599
Grater, corn, N. McKeever 892,873
Grubber, grass, C. W. Stark 892,910
Hand grasp, compound for assisting in effecting a, A. T. Johnson 892,844
Harness loop former, O. O. Harris 892,722
Harvester, peanut, H. E. Galbraith 892,587
Hat, coat, and umbrella rack, combined, J. N. & W. T. Courtney 892,407
Hay rake, folding, W. C. Jones 892,736
Heel, boot and shoe, S. Burnham 892,647
High frequency apparatus, C. C. Ruprecht 892,764
Hinge, H. Zimmerman 892,491
Hinge, B. E. Byrd 892,577
Hinge, barn door, W. L. Selleck 892,556
Hoe, B. R. Williams 892,607
Hoeing implement, F. Vejrosta 892,968
Hog holder, adjustable, F. McComb 892,540
Hoist, D. E. Rowland 892,896
Hoist, F. P. Snow 892,907
Hoist, chain, H. J. Bur 892,973
Hoisting mechanism, V. R. & E. H. Browning 892,802
Hoop for exhibition purposes, H. W. Crichton 892,710
Hoops, link connection for the ends of receptacle, K. W. Jacobs 892,732
Hopple, L. N. Perkins 892,546
Horseshoe calk, O. Sprister 892,562
Horseshoe pad, J. B. White 892,699
Hose pipe coupling, C. A. Jeffreys 892,524
Hose supporter, P. Cohen 892,651
Hot air register, S. W. Joy 892,431
Hub attaching device, A. H. Worrest 892,701
Humidifier, H. C. Townsend 892,778
Humidor, F. A. Traver 892,916
Hydrocarbon burner, L. A. Blubaugh 892,706
Ice cream dipper, E. Walker 892,633
Ice machine, vertical, D. L. Holden 892,424
Incubator and brooder heater, L. N. Porter 892,619
Incubator regulator, P. M. Wickstrum 892,635
Index, card, M. A. Repelow 892,890
Index rods, centering device for card, P. H. Yawman 892,488
Induction coil unit, C. A. Pfanstiehl 892,763
Inhaler, G. Ermold 892,717
Inking rollers, machine for cleaning, C. Wagner 892,782
Insect destroyer, J. J. Vickers 892,781
Insulated coupling for electric conductors, J. J. Dossert 892,411
Insulator, electrical, H. F. Selinger 892,626
Internal combustion engine, J. H. Cogswell 892,501
Jar lifter, J. W. Gienger 892,588
Kitchen utensil, H. L. Clark 892,404
Knitting machine feeding device, J. D. Hemphill 892,663
Knitting machine, straight, W. W. Burson 892,933
Knitting machines, pattern mechanism for straight, J. Schutz 892,902
Label holder, V. H. Canham 892,398
Lamp, electric arc, C. P. Steinmetz 892,768
Lamp, miner's, A. Husson 892,836
Lamp regulating mechanism, arc, Warner & Wiler 892,475
Lamp socket, electric, J. H. Hanson 892,721
Latch, F. N. Beacom 892,796
Lathes, multiple tool holding slide rest attachment for, D. J. Smith 892,457
Lead, making arsenate of, Luther & Volck 892,603
Leaks in steam apparatus, compound for stopping, J. N. Hoag 892,521
Leather, rawhides or skins, hoofs, horns, or bones of animals, treatment of waste, A. G. Inrig 892,840
Letter sheet, W. T. Morrison 892,675
Linotype machines, liner for molds for, Roseberry & Junkin 892,685
Liquid sampler, J. J. Drawe 892,944
Lithographic presses, inking mechanism for rotary, D. A. Wilson 892,700
Loaf molding machine, Smith & Campbell 892,559
Lock, J. Carlson 892,649
Locomotive cab seat, E. M. Stannard 892,692
Loom pattern mechanism, H. Bardsley 892,926
Loom shuttle, E. E. Orrell 892,881
Loom shuttle box motion, E. R. Holmes 892,727
Machinery, means for controlling, Peters & Morgan 892,616
Magnet, lifting, V. R. Browning 892,931
Mail and package deliverer, automatic electric motor driven, G. H. Ferlin 892,586
Mail bag apparatus, train delivering and station receiving, W. N. West 892,786
Mail bag catcher and deliverer, J. Bubb 892,803
Mail bag catching and delivering device, L. H. Page 892,680
Mail bag deliverer and receiver, B. Cohen 892,582
Mail cart, E. D. Falkner 892,509



For Accurate Work

Machine shop experts everywhere agree as to the superiority of the famous

"STAR" LATHES

for efficiency, adaptability and durability. Easy to operate, economical to work. Uniform excellence of work. Famous at home and abroad. Write for our latest descriptive free catalog.

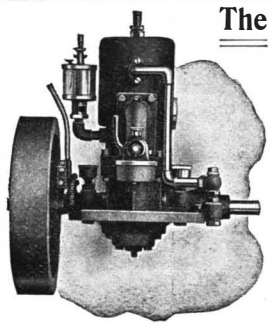
THE SENECA FALLS MFG. CO.
695 Water St., Seneca Falls, N. Y.

B-7

Engine and Foot Lathes

MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE

SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.



The Cushman

The

"MOTOR OF MERIT"

Honestly Built
Honestly Sold
2, 4, 8, 14 H.P.

They are made for the man who wants the best.

CUSHMAN MOTOR COMPANY
2026 N. St., Lincoln, Neb., U. S. A.

FOX MOTORS
HIGH SPEED-HEAVY DUTY

COMPLETE 1 TO 6 CYL

Our 15 sizes of High Speed and Heavy Duty Motors are fully described in our catalog. The sanest, most direct and most convincing motor catalog ever issued. Write for it.

THE FOX REVERSIBLE GASOLINE ENGINE CO.
213 Front St., South Cincinnati, Newport, Ky.

PATENTS

Our Hand Book on Patents, Trade-Marks, etc., sent free. Patents procured through Munn & Co. receive free notice in the

SCIENTIFIC AMERICAN

MUNN & CO., 361 Broadway, N. Y.
BRANCH OFFICE: 625 F St., Washington, D. C.

THE "BARNES"
Positive Feed **Upright Drills**
10 to 50-inch Swing

Send for Drill Catalogue.

W. F. & JNO. BARNES CO.
(*Established* 1872)
1999 Ruby St., Rockford, Ill.

TRADE MARK W. F. & J. B.

ELECTRIC LAUNCH MOTOR. — THE design in this paper is for a motor of unusual simplicity of construction, which can easily be built by an amateur at small cost. It is intended for a boat of about 24 feet over all and 4 feet 6 inches beam, drawing 18 inches, and is capable of propelling such craft at a speed of 7 miles per hour. Illustrated with 21 cuts. See SCIENTIFIC AMERICAN SUPPLEMENT, No. **1202.** Price 10 cents by mail, from this office and from all newsdealers

3 to 5 H. P.
$49
Bare

Little Giant
GASOLINE MOTORS

Reliable, Reversible, Two Cycle. Two and Three Port. Guaranteed for one year. Simple and easy to operate. Our Free Catalog A3 is worth your having.

Send 10 cents in stamps for our book entitled "Ignition, Vaporization, Installation and Operation of a Gasoline Motor."

UNITED MFG. CO., - - Detroit, Mich

WELL DRILLING Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.

HOW Manufacturers Can Increase Their Business

Read carefully, every week, the

Classified Advertising Column

in the

SCIENTIFIC AMERICAN

Some week you will be likely to find an inquiry for something that you manufacture or deal in. A prompt reply may bring an order.

Watch it Carefully

Mailing device, H. M. O'Reilly	892,879
Mailing folder, R. G. Stevens	892,461
Manure spreaders, beater for, S. Robinson	892,451
Match box, K. E. Blomquist	892,391
Match boxing machine, W. H. Parker	892,545
Match making machine, J. W. Lundgren	892,609
Mattress, spring, C. W. Stevens	892,566
Measuring apparatus, height, W. H. Johnson	892,735
Measuring device, liquid, G. F. Egan	892,584
Measuring instrument with telescope, angle, H. Jacob	892,731
Metal cutting machines, sliding table or carriage for, A. C. Krebs	892,854
Metal, expanded, F. H. Crittall	892,938
Metal working machines, work holding mechanism for, E. W. Bemis	892,927
Meter. See Grain meter.	
Milking organs, covering for, H. von Celsing	892,401
Mine door, J. Wack	892,632
Mine shaft safety device, N. W. Dickerson	892,653
Mining machine, R. D. Secoy	892,964
Mirror bracket, E. C. O'Neill	892,612
Mixing machine, J. B. Hinchman	892,518
Mixing machine delivery spout, J. B. Hinchman	892,519
Mop, J. H. Johnson	892,845
Motor control system, electric, F. D. Hallock	892,419
Motor control system, electric, F. W. Harris	892,421
Motor control system, electric, H. D. James	892,429
Motor controller, alternating current, G. W. Euker	892,656
Mouth organ, P. Messner	892,672
Mouth prop, R. S. Price	892,682
Mowers and harvesters, attachment for cutter bars of, H. Beyreis	892,799
Mowing machine, lawn, E. M. Mitchell	892,536
Musical instrument, A. Sorglechner	892,908
Musical instrument, stringed, O. L. Gesell	892,718
Necktie maker, L. C. Wedgefuth	892,921
Necktie maker and holder, L. C. Wedgefuth	892,920
Necktie maker or former, L. C. Wedgefuth	892,919
Net machine, fly, J. Graves	892,827
Newspaper holder, J. N. King	892,738
Newspaper wrapping machine, I. R. Hutchinson	892,837
Nipples, making, Wolf & Struck	892,792
Nozzle, exhaust, C. F. Wilde	892,482
Nut and washer, locking, A. L. Dorsey	892,507
Nut device, lock, J. H. Wesson	892,478
Nut lock, J. H. Wesson	892,479
Nut lock, A. R. Byrkett	892,578
Nut lock, J. F. Huffman	892,834
Observatory applicable for use in connection with military and other operations, folding, Schneider & Rimailho	892,686
Overshoe, N. P. Bowler, reissue	12,822
Package tie, Drawe & Turnbull	892,945
Packing, J. P. Randerson	892,620
Packing device, joint making, F. Seebeck	892,765
Padlock, combination, J. J. Deal	892,941
Pail, oyster, W. Heyser	892,725
Paper box, H. H. Stonebarger	892,463
Paper, box for keeping carbon, F. C. Gottschalk	892,661
Paring machine, apple, W. H. Boutell	892,393
Paring machine, fruit, W. H. Boutell	892,394
Pen attachment, J. Winger	892,791
Pen, drawing, C. Fitzsimmons	892,950
Peroxide of potassium, manufacture of, G. F. Jaubert	892,842
Phonograph, O. Arnold	892,494
Phonograph and graphophone apparatus, J. O. Hirschfelder	892,520
Phthalic acid salts of cotarnin and product resulting therefrom, preparation of, M. Freund	892,414
Piano, C. E. Fauth	892,511
Piano player, pneumatic, C. E. Pryor	892,887
Piano players, action for pneumatic, E. Carlson	892,400
Piano tuning hammer, combination, C. P. Dolan	892,506
Pianos, tune sheet attachment for autopneumatic, A. J. Hobart	892,423
Picture machines, light shield for moving, J. J. Pink	892,547
Pile fabric and weaving same, A. Heald	892,517
Pin holder, E. W. Forney	892,820
Pipe. See Tobacco pipe.	
Planetarium, N. W. Hurst	892,835
Planter, peanut, N. J. & F. L. Lanotte	892,745
Planter, seed, S. C. Thomas	892,967
Plating machine, C. Glover	892,417
Plow standard fender, A. G. Steele	892,564
Plumb and level, gravity, J. Unger	892,468
Poke, animal, J. R. Duckett	892,946
Pole, R. S. Orr	892,880
Pole top cap, J. W. Fraser	892,822
Polychloramidin and making same, Schraube & Laudien	892,900
Portable house, H. J. Armstrong	892,571
Post. See Concrete post.	
Post and tile mold, F. & C. J. Helm	892,592
Power transmitting device, G. R. Dean	892,714
Power transmitting mechanism for metal working machines, G. O. Gridley	892,662
Propulsion, boat, A. T. Ronstrom	892,454
Pulley block, A. H. Neller	892,678
Pump piston, C. A. Killian	892,594
Pump regulator, T. M. Wilkins	892,788
Pyroxylin, covering objects with sheet, A. E. Wyman	892,702
Racks, separator strip for slide, A. C. Roebuck	892,684
Radiator, G. W. Nutz	892,761
Rail joint, H. S. Shafer	892,557
Rails shifting or creeping, device for preventing, A. Dameris	892,505
Railway apparatus, controlling means for, Williams & Harrington	892,637
Railway appliances, controlling apparatus for, Williams & Harrington	892,636
Railway crossings, electrically operated signal for, G. W. Lancaster	892,857
Railway guard rail appliance, E. Muir	892,869
Railway switch safety appliance, J. D. Guilfoyle	892,591
Railway tie, R. S. Pease	892,762
Railway tie and means for securing rails thereto, metallic, G. H. & C. E. McConvill	892,541
Railway train order system, E. W. Appelman	892,493
Railway train safety appliance, electric, E. T. Munger	892,677
Railway train safety appliance, electric, A. H. Daus	892,712
Railway train safety appliance, electric, H. A. Johnson	892,734
Railway trip shoe, C. M. Hurst	892,728
Railways, electric indicating system for, H. G. Dorsey	892,814
Railways, electric safety signal for, Pernat & Kerkowitz	892,882
Rake head bar and tooth, C. E. B. Long	892,532
Rat trap, W. E. Morris	892,756
Razor, J. E. Leresche	892,750
Razor guard, T. Owens	892,679
Razor, safety, G. P. Taylor	892,629
Razor, safety, H. S. Buckland	892,707 to 892,709
Reamer, C. Feagler	892,585
Reamer, adjustable, F. B. McCrosky	892,871
Refrigerator car, E. Posson	892,447
Rock and ore crusher, W. H. Lloyd	892,861
Rock breaker, subaqueous, E. Burhorn	892,645
Rocking chair, Cowles & Morrill	892,937
Roofing or covering, tile, I. P. Walker	892,917
Roofing, sheet metal, L. Stein	892,693
Rotary engine, A. I. Ostrander	892,443
Roving machines, etc., flier for, F. H. Martin	892,863
Rubber fastening device, H. R. Nelson	892,760
Runner, detachable, C. F. Toennies	892,777
Safe, vault, etc., W. C. Fuller	892,514
Sash fastener, W. J. Mitchell	892,537
Sash lifter, W. R. Bull	892,644
Sash lock, M. A. Beeman	892,797
Sash stop, M. M. Bagby	892,970
Saw, S. Rose	892,895
Sawmill recorder, J. W. P. Burdine	892,805
Scale beam, A. Scrivenor	892,690
Scale, weighing, W. G. Templeton	892,773
Seal lock, W. L. Sebring	892,625
Sewed articles, seam for, T. Libby	892,438
Sewing machine, R. Brown	892,643
Sewing machine guard attachment, E. R. Bailey	892,794

THIS handsome new Hotel is situated at NORWAY POINT, LAKE OF BAYS, "HIGHLANDS OF ONTARIO," CANADA, with accommodations for 150 guests.

Modern in Every Respect. Pure Mountain Spring Water
Electric Lighted Throughout. Delightfully Situated
Hot and Cold Water in every room. Good Fishing
Hay Fever Unknown. 1000 Feet above Sea Level
Fine Bathing Beaches. Good Steamboat Service
Boating for all Kinds of Craft.

Write for copy of Handsome Booklet descriptive of the territory, to any of the following:

G. W. VAUX, 917 Merchants Loan & Trust Bldg., Chicago
F. P. DWYER, 250 Broadway, New York City
E. H. BOYNTON, 360 Washington St., Boston, Mass.
W. ROBINSON, 506 Park Bldg., Pittsburg, Pa.

W. E. DAVIS,
Passenger Traffic Manager, Montreal

G. T. BELL,
General Passenger & Ticket Agent, Montreal

Sherlock Holmes is Coming Back

TWO more "reminiscences" by Dr. Watson of the Great Detective are to see the light. The first one is entitled "The Singular Experience of Mr. J. Scott Eccles." It will appear in COLLIER'S for August 15th, which will be a "SHERLOCK HOLMES" Number. There will be an intimate sketch of Sir Arthur Conan Doyle, creator of Sherlock Holmes, of his old teacher, Professor Bell of Edinburgh, who was the original of the Great Detective, and many anecdotes and illustrations of the unique place in literature and on the stage achieved by "the greatest character in fiction since *Monsieur Dupin*."

Here is what Collier's Fiction Editor wrote:

"I think I can safely say that it is one of the most remarkable detective stories of modern times. Not only is the plot novel, but the author brings to this tale all of the atmosphere of mystery and the extraordinary character drawing which long ago made him famous. I consider the story a great asset for any periodical. It is one of those cases where an author wins success along a certain line, creates a band of imitators, drops out for a time, and then comes back as if to show just how good he really was."

Collier's
The National Weekly

Sherlock Holmes Number—August 15th

Do You Want Good Information Cheap?

Write to us and we will refer you to a SCIENTIFIC AMERICAN SUPPLEMENT that will give you the very data you need.

SCIENTIFIC AMERICAN SUPPLEMENT articles are written by men who stand foremost in modern science and industry.

Each SCIENTIFIC AMERICAN SUPPLEMENT costs only 10 cts. But the information it contains may save you hundreds of dollars.

Write for a catalogue of SUPPLEMENT articles. It costs nothing.

Act on this suggestion!

MUNN & COMPANY
361 Broadway, New York

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than ten lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry **may** be repeated.

MUNN & CO.

BUSINESS OPPORTUNITIES.

WANTED.—I am open to take over the agency or represent in New York and the Eastern States or for the entire United States one or two good accounts on commission basis. I have an office and all the facilities necessary to secure business. Can furnish highest bank and business references. For further information address A. Raynor, Post Office Box 773, New York City.

Inquiry No. 8607.—Wanted to buy an electric incubator.

TRAVELING SALESMEN earn from $2,000 to $20,000 a year and expenses. We will teach you to be one by mail at your home in eight weeks and assist you to secure a position with a reliable firm. No former experience required. We place our graduates with the best firms in the United States. If you are ambitious, write for our free catalog, "A Knight of the Grip," and list of good positions now open. Dept. 314 National Salesman's Training Ass'n, Chicago, Ill., Kansas City, Mo., or Minneapolis, Minn. Write nearest office. Mention this paper.

Inquiry No. 8611.—Wanted to buy springs for light power purposes.

THE COSMO Contracting Syndicate, Kingsway House, Kingsway, London, buy English patents of proved ability—articles for mail order business, pronounceable figure codes, coding devices. Send particulars & samples.

Inquiry No. 8620.—Wanted to buy aluminium cans.

THE AMERICAN RIGHTS FOR SALE of fully protected method of reducing cost of cablegrams by nearly half, applicable to all codes and languages. Patents of real utility placed in Europe. Cosmo Contracting Syndicate, Kingsway House, London, W. C.

Inquiry No. 8628.—Wanted to buy paving block machines for use with partly fluid substances.

PATTERN LETTERS AND FIGURES (White Metal and Brass) for use on patterns for castings. Large variety, prompt shipments. Send for catalog. H. W. Knight & Son, Seneca Falls, N. Y.

Inquiry No. 8632.—Wanted to buy machine for perforating music rolls.

WANTED.—Useful Novelties, practical tools, labor saving devices for use in shipping and packing departments. Any good articles which will facilitate shipping, packing or branding goods. Address B. & S. Co., Box 773, New York City.

Inquiry No. 8646.—Wanted to buy cheap small motor from ¾ to 1 horse power, single phase 60 cycle, 110 volts.

PATENTS FOR SALE.

FOR SALE.—Patent right No. 840,800. Locked coat hook. Large demand for it. Patentee has not funds to promote it. Full particulars on request. Address A. C. Pegan, 713 So. East St., Indianapolis, Ind.

Inquiry No. 8649.—Wanted to buy non-inflammable celluloid.

FOR SALE: Melon Carrier. Patent No. 882,722, date March 24, 1908. Send for Descriptive Circular to W. A. Stark, Webster Flats, Tacoma, Wash.

Inquiry No. 8650.—Wanted to buy file cutting machinery.

WANTED.—To sell outright or on royalty, high speed cloth winding and measuring machine for dry goods. Patent No. 883,690. Bolts perfectly. Accurate. Address Edward Blythe, Decatur, Texas.

Inquiry No. 8652.—Wanted address of manufacturers of drop forged wrenches.

FOR SALE.—Patent rights No. 885,252, issued April 21, 1908. Rake shoe. Will sell outright. Also patents allowed on guarded knife and leather cutting draw gage, will be issued in July, 1908. For further particulars and full information address The Hughes Manufacturing Company, No. 80 First Street, Portland, Oregon.

Inquiry No. 8653.—Wanted addresses of dealers in sheet steel, New York city preferred.

WILL SELL STATES RIGHTS, Patent No. 888,668. Parachute Arrow. Most interesting and amusing toy. Greatest advertising novelty of the day. Write for drawings. P. O Box 908, Spokane, Wash.

Inquiry No. 8654.—Wanted addresses of case-hardeners in New York.

FOR SALE ON ROYALTY OR OUTRIGHT. Non-refillable bottle. Letters Patent No. 891,052, June 16, 1908. Simple and effective. Address H. F. Erfman, Miamisburg, Ohio.

Inquiry No. 8661.—Wanted to buy machinery for making cutlery.

BOOKS AND MAGAZINES.

BUILD MISSION FURNITURE. Send 20 cents for three designs of easily made pieces of furniture for hall, den or library. Full directions for making and putting together. Furniture can be made by anyone who can handle a saw. List of books on home handicrafts free. Ask for free sample copy of Electrician and Mechanic, finely illustrated magazine written in popular style, devoted to all kinds of mechanical work. Sampson Publishing Company, 151 Beacon Building, Boston, Mass.

Inquiry No. 8666.—Wanted to buy screw making machinery.

MISCELLANEOUS.

IF YOU CAN HANDLE carpenters' tools and interested in motor boats, write, giving length of boat, to Harry A. Bush, Waite Street, Malden, Mass.

Inquiry No. 8667.—Wanted to buy needle, pin and pen machinery.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at the rate of $13.00 per thousand, for large quantities, for big industries and callings. Small and special lists compiled to order at various prices. Thus 100 windmill manufacturers list would cost $2.50, etc. Address A. A. H., Box 773, New York.

Inquiry No. 8669.—Wanted to buy machinery for making rifle barrels.

A LIST OF 1,500 mining and consulting engineers on cards. A valuable list for circularizing. Price $15.00. Address A. A. H., Box 773, New York.

Inquiry No. 8671.—Wanted to buy welting and machinery for making same.

Inquiry No. 8674.—Wanted to buy machinery for cultivating rice and making Yuca starch.

Inquiry No. 8678.—Wanted to buy cheap sewing machines.

Inquiry No. 8680.—Wanted to buy cheap watches.

Inquiry No. 8681.—Wanted to buy envelope making machines.

Inquiry No. 8682.—Wanted to buy model of old battleship "Maine."

Inquiry No. 8683.—Wanted to buy plant for making cassava starch.

Inquiry No. 8685.—Wanted to buy 1½ to 2-inch No. 13 to 18 tempered spring steel.

Inquiry No. 8687.—Wanted to buy motor plows.

Inquiry No. 8691.—Wanted to buy for export to British Guiana alcohol motors.

Inquiry No. 8692.—Wanted to buy kerosene oil motors for export.

Inquiry No. 8693.—Wanted to buy meteorological instruments.

Inquiry No. 8694.—Wanted to buy fly wheels and ball bearings.

Inquiry No. 8696.—Wanted to buy toy balloons.

Inquiry No. 8697.—Wanted to buy zinc can screw tops.

Inquiry No. 8698.—Wanted to buy a hydrochloric acid plant.

Inquiry No. 8699.—Wanted to buy two-stranded soldered wire for heddles.

Inquiry No. 8701.—Wanted to buy solar engines.

Inquiry No. 8705.—Wanted to buy double shaft engines for automobiles.

Inquiry No. 8706.—Wanted to buy ink and mucilage bottles and labels.

Inquiry No. 8707.—Wanted to buy hand power vacuum cleaner.

Inquiry No. 8710.—For machinery for carding, spinning and weaving jute.

Inquiry No. 8713.—For manufacturers and dealers of cement manufacturing machinery and kilns.

Inquiry No. 8716.—For manufacturers of flower garden and light frame tools for cultivating, etc.

Inquiry No. 8717.—Wanted address of firms that do wood carving or stone carving, ornamental or in buildings.

Inquiry No. 8719.—For manufacturers of safes.

Inquiry No. 8720.—Wanted for mail order business, no-chimney lamp burners.

Inquiry No. 8721.—Wanted unwelded tubing that is used for structural work.

Inquiry No. 8722.—Wanted manufacturers of glass.

Inquiry No. 8723.—Wanted addresses parties dealing in mining machinery such as used in gold mining.

Inquiry No. 8724.—Wanted to buy samples of various kinds of French marble for collection.

Inquiry No. 8725.—For manufacturers of a needle-threader, not the thimble and needle combination.

Inquiry No. 8726.—For parties who make "Yankee Metal Polish."

Inquiry No. 8728.—Wanted the address of The Frear Novelty Co.

Inquiry No. 8729.—Wanted a machine for manufacturing berry-crates complete.

Inquiry No. 8731.—Wanted a rice mill or huller that delivers the rice entire and separate from the hull.

Inquiry No. 8732.—For manufacturers of industrial alcohol machinery.

Inquiry No. 8734.—Wanted to buy fusible metal which melts at 165 degrees, similar to that used by manufacturers of automatic sprinkler heads, also who makes the disks used to keep the head normally closed.

Inquiry No. 8735.—For parties making a still for the purpose of extracting alcohol from saw-dust.

Inquiry No. 8736.—For manufacturers of machinery for making matches, also machinery for making purses and hand bags.

Inquiry No. 8737.—For manufacturers of machinery for making tooth-brushes, shaving brushes, galvanized water buckets, locks, nibs and holders.

Inquiry No. 8738.—For parties manufacturing casein cement.

Inquiry No. 8739.—Wanted machinery to make pencil and pen retainer made of spring wire.

Inquiry No. 8740.—For manufacturers of Chicago typewriter.

Inquiry No. 8741.—For manufacturers of fireless cookers.

Inquiry No. 8742.—For manufacturers of water still, also of thermometer tubing.

Inquiry No. 8743.—Wanted to buy a machine to make macaroni, spaghetti and vermicelli to turn out 100 lbs. per day of each, by hand power.

Inquiry No. 8744.—Wanted a machine for making briquettes for fuel from wooden shavings or combined with pitch or other binder.

Inquiry No. 8745.—For manufacturers of hoops such as used as toys, varying in diameter from 2⅜ to 4 feet, cross section approximating ¼x½ inch, the ends being lapped and tacked.

Inquiry No. 8746.—For dealers in paper and cardboard making machines.

Inquiry No. 8748.—Wanted to buy polished or lacquered brass in sheets 29 gauge, quarter hard in temper.

Inquiry No. 8749.—For makers of very large springs, used for running machinery.

Inquiry No. 8751.—For manufacturers of brass, tea, dessert and table spoons for silver plating.

Inquiry No. 8752.—For manufacturers of paper mill machinery for the manufacture of strawboard and wrapping paper.

Inquiry No. 8753.—For manufacturers of hotel register revolving stands and hotel novelties.

Inquiry No. 8754.—For the party who makes an umbrella which when raised allows the holder to stand directly underit, the handle being away from the center.

Inquiry No. 8755.—Wanted to buy boat loads of lumber to be used in box making.

Inquiry No. 8757.—Wanted address of the manufacturer of "The Index Incandescent Kerosene Burner."

Inquiry No. 8759.—For a firm to do porcelain enameling of ventilator tops, such as used on the outside of arc lamps.

Inquiry No. 8760.—For a manufacturer who can manufacture a new type of hook and eye device.

Inquiry No. 8761.—Wanted to buy a small carriage propelled by electricity so that a lame person may get about by himself.

Inquiry No. 8762.—For manufacturers of a patented pants stretcher made mostly of wood, the top and bottom clamps being extended apart by two wooden slips which are connected by some sort of adjustment feature.

Inquiry No. 8763.—Wanted parties who can make ornaments of wood pulp scroll-shaped.

Inquiry No. 8764.—Wanted to buy smokers' fancy goods of all kinds.

Inquiry No. 8765.—For manufacturers of insulating paper linings used in metal covers of electric snap switches; also makers of insulating papers and tools.

Inquiry No. 8766.—For parties making pressed paper goods.

Inquiry No. 8767.—Wanted to buy cars for a railroad with a radius of 100 miles, which will run by gasoline power.

Inquiry No. 8768.—For manufacturers of black plate glass.

Inquiry No. 8769.—For manufacturers of an appliance to attach to the old style razor blade to make same a safety razor.

Inquiry No. 8770.—For parties who make short link twist chains, links from ⅛ inch up.

Inquiry No. 8771.—Wanted to buy tune sheets for Criterion music boxes.

Inquiry No. 8772.—For a machine to make paper bottles for holding milk.

Inquiry No. 8773.—For manufacturers of distilling machinery for making alcohol and denaturizing the same with small capacity.

Inquiry No. 8774.—For machinery for making bags from sisal hemp.

Inquiry No. 8775.—Wanted to buy stock novelty or jewelry catalogues.

Inquiry No. 8776.—For manufacturers of mail order novelties and also manufacturers of hand power vacuum cleaner machines.

Inquiry No. 8777.—Wanted to buy a portable photographing outfit for street use.

Inquiry No. 8778.—For manufacturers of reapers, binders and mowers.

Inquiry No. 8779.—For parties manufacturing gas, gasoline, steam engines and boilers; also packing and mineral wool, steam supplies, iron and lead pipe, power transmission machinery and steam fitters' tools.

Inquiry No. 8780.—For parties who make gasoline stoves.

Inquiry No. 8781.—For manufacturers of bass and snare drum shells and hoops.

Inquiry No. 8782.—For manufacturers of Chinese wood drums, tom toms and cymbals.

Sewing machines, cast off friction for, M. D. Hebert 892,958
Shade hanger, window, B. F. Bellows 892,795
Sharpener, knife, L. Jauch 892,667
Sheet metal can, M. M. Kane 892,848
Shelf bracket, M. E. McMaster 892,542
Shelf operating mechanism, Turner & Singleton 892,779
Shoe, L. J. Lucke 892,601
Shoes, tack machine for operating on lasted, C. F. Pym 892,888
Shunt, F. W. Roller 892,554
Shutter fastener, H. Zimmerman 892,490
Sifter, J. W. Robisch 892,892
Sifter, ash, M. Froese 892,952
Sign, B. J. Foy 892,658
Sign apparatus, electric, R. F. Le Brocq 892,749
Sign, metal, F. W. Perry 892,615
Signal device, J. W. Atlee 892,572
Silo filling device, W. W. Bateman 892,498
Skate, roller, W. McLay 892,758
Sled brake, T. Tomlinson 892,695
Smoke siphon, R. W. Kilpatrick 892,527
Smoking tube, C. H. Rotsch 892,555
Speed changing mechanism, W. W. Earl 892,947
Speedometer, D. H. Haywood 892,723
Spinning and twisting spindle, Westcott & Allen 892,480
Splice bar, U. G. Cassady 892,809
Spraying device for dampening fabrics, S. Kops 892,741
Stalk cutter, W. H. Stopple 892,628
Stay, garment, D. Schuler 892,689
Steam shovel, W. M. Gross 892,829
Steam trap, J. M. Shumate 892,766
Steel sheets, apparatus for oxidizing, W. M. Blecker 892,929
Steel sheets, oxidizing, W. M. Blecker 892,971
Stock sampler, J. J. Drawe 892,943
Stop motion, E. E. Taliaferro 892,915
Store service apparatus, C. J. Miller 892,535
Store service apparatus, P. Tripke 892,631
Stove cover lifter, J. Werner 892,697
Stove finish, T. Frye 892,823
Stove, heating, G. D. Neavitt 892,759
Strainer, F. M. I. Reeve 892,551
Streams, method and means for straightening, deepening, and controlling, D. Neale 892,610
Striking bag support, F. P. Aumann 892,388
Striking cup attachment, B. E. Taylor 892,771
Superphosphate chambers, device for emptying, A. P. Keller 892,593
Supporting device, M. M. Black 892,800
Swing, B. Inglish 892,664
Switch mounting, A. E. De France 892,410
Switch operating mechanism, Hyman & Hay 892,838
Switch stand, G. L. Mansfield 892,753
Table leg fastener, A. J. Innes 892,839
Telephones and the like, ringer for, E. R. Hobbs, reissue 12,828
Tennis courts, etc., device for marking, Lancaster & Nichols 892,962
Tent, H. P. Whinnery 892,698
Theater appliance, M. Littmann 892,600
Thill coupling, G. A. Stiles 892,694
Thill coupling, antirattler, Burnop & Spitzli 892,397
Threshing machine concave, F. F. Landis 892,529
Ticket issuing and recording machine, Ohmer & Bridenbaugh 892,876
Tie and rail fastening, combined, J. T. Tonry 892,568
Tire for vehicle wheels, pneumatic, J. R. Kline 892,853
Tire retainng attachments, locking device for, R. S. Bryant 892,801
Tire shield, R. H. Faughnder 892,948
Tire, wheel, A. Michelin 892,673
Tobacco pipe, J. Yoakum 892,793
Tongs, plow, E. L. Thomas 892,774
Tongue, adjustable wagon, H. J. Lawrence 892,746
Tongue support, wagon, W. A. & W. T. Walker 892,696
Toy railway crossover, H. C. Ives 892,666
Toy trolley railway, E. R. Ives 892,665
Train safety device, electric, A. H. Daus 892,713
Trolley wire crossing, overhead, R. C. McKiliget 892,874
Trousers supporter, W. A. Payne 892,446
Trunk fastener, T. W. Maddux 892,533
Tunnel segments, making, F. F. Vandevort 892,469
Turbine, multistage, E. Mertz 892,440
Turbine, steam, S. Z. de Ferranti 892,818
Turbo generator construction, A. H. Wouters 892,487
Typewriting machine, M. W. Pool 892,618
Typewriting machine, H. H. Steele 892,627
Typewriting machine, A. W. Hewitt 892,724
Typewriting machine spacing device, C. J. Mohns 892,964
Typographic machine, F. H. Richards, 892,624, 892,891
Umbrella, folding, J. F. Dolles 892,813
Umbrella, parasol, and the like, H. G. Walters 892,473
Underreamer, R. E. Simpson 892,905
Universal coupling, F. W. Smith 892,558
Valve, F. Fowler 892,821
Valve, adjustable distributing, J. Engelen 892,816
Valve for car heating appliances, safety, E. H. Gold 892,515
Valve for the air ducts of brick kilns and the like, E. H. Callaway 892,579
Valve mechanism, motor, E. G. Howard 892,833
Valve, pressure reducing, T. Robinson 892,450
Vats or keirs, machine for automatically folding or plaiting goods in, J. Gremminger 892,828
Vault, burial, J. W. Sparks 892,458
Vaults, locking closure for burial, J. W. Sparks 892,909
Vehicle, J. W. & B. D. Glascock 892,824
Vehicle spring, G. Koch 892,595
Vehicle washer, L. E. Rhodes 892,448
Vehicle wheel, motor, H. H. Boyce 892,395
Vehicle with automatic movement of rails, T. Polakoff-Kowtunoff 892,681
Vehicles, device for transferring boxes from and to, I. Lester 892,437
Vehicles, fuel burning apparatus for motor, G. E. Whitney 892,569
Vending apparatus, prepayment, F. A. Lane 892,434
Vending machine, Rast & Schrum 892,683
Vending machine, G. D. Schrum 892,687, 892,688
Vending machine, E. J. Haverly 892,956
Vessel closure, W. H. Prest 892,886
Vessels, metallic head for, E. C. Thorschmidt 892,775
Voting machine, P. Yoe 892,489
Wafer cutting machine, H. H. Hungerford 892,428
Wagon propeller, A. D. Austin 892,495
Wagon skid holder, J. B. Ratliff 892,621
Washboiler, W. W. Wilson 892,922
Washer. See Vehicle washer.
Washstand, E. P. Howe 892,523
Waste, mechanical, G. H. Burleigh 892,646
Watchcase, J. M. Biggs 892,642
Water and sewage, purifying, A. E. Woolf 892,486
Water heater, A. F. Mustee 892,870
Water level indicator, W. C. Horner 892,425
Water motor, L. C. Lewis 892,531
Water purifier and oil separator, M. B. Creswell 892,504
Water, etc., sterilizing, R. Cambier et al 892,580
Water tube boiler, C. S. Hooper 892,522
Wave motor, B. C. Thrasher et al 892,567
Well drilling machinery, H. R. Decker 892,409
Well strainers, manufacturing, F. I. Getty 892,660
Well tubes, machine for manufacturing screenings for, F. I. Getty 892,659
Wells, wall packer for oil, E. E. Tirk 892,776
Wheel, A. B. Ament 892,640
Whiffletree, F. Reed 892,622
Whip socket, locking, F. Bergholm 892,390
Winder, bobbin, E. Walder 892,783
Winders, machine for covering board, J. W. Lacross 892,597
Window, Merz & Heine 892,605
Window screen, H. C. Warfield 892,918
Window, swinging, G. H. Parker 892,444
Winnowing machine, F. F. Landis 892,598
Wood chipping machine, O. Carr 892,808
Wood milling machine, G. A. Krauss 892,596
Wrench, Z. B. Custer 892,408
Wrench, G. T. Barr 892,497
Wrench, W. F. Corbin 892,503
Wrench, H. H. Ponton 892,549
Yarns, apparatus for treating woolen, G. Stone 892,911
Yoke, spring, L. H. Jenkins 892,430

Important Books

The Scientific American Cyclopedia of Receipts, Notes and Queries

15,000 RECEIPTS **734 PAGES**

Price $5.00 in cloth

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the SCIENTIFIC AMERICAN during the past sixty years, together with many valuable and important additions.

Over Fifteen Thousand selected receipts are here collected, nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

Industrial Alcohol

ITS MANUFACTURE AND USES

A Practical Treatise based on Dr. MAX MAERCKER'S "Introduction to Distillation" as revised by Drs. DELBRÜCK and LANGE. Comprising Raw Materials, Malting, Mashing and Yeast Preparation, Fermentation, Distillation, Rectification and Purification of Alcohol, Alcoholometry, the Value and Significance of a Tax-Free Alcohol, Methods of Denaturing, Its Utilization for Light, Heat and Power Production, a Statistical Review and the United States Law.

By JOHN K. BRACHVOGEL, M.E.

528 Pages 105 Illustrations Price $4.00

GAS, GASOLINE and OIL ENGINES

Including Gas Producer Plants

By GARDNER D. HISCOX, M.E.

Price $2.50

The only complete American book on the subject for Gas Engine Owners, Gas Engineers, and intending purchasers of gas engines, treating fully on the construction, installation, operation and maintainance of gas, gasoline, kerosene, and crude petroleum engines.

The new rewritten, enlarged, and revised 15th edition of this work has been prepared to meet the increasing demand for a thorough treatise on the subject. Its 450 pages give general information for everyone interested in this popular motive power, and its adaptation to the increasing demand for a cheap and easily managed motor requiring no licensed engineer. It is fully illustrated by 351 engravings and diagrams.

Modern Machine Shop Construction

Equipment and Management

By OSCAR E. PERRIGO, M.E.

Nearly 400 Large Quarto Pages, Illustrated by over 260 Engravings Specially Made by the Author. Price $5.00

A work designed for the practical and every-day use of the Architect who designs, the Manufacturers who build, the Engineers who plan and equip, the Superintendents who organize and direct, and for the information of every Stockholder, Director, Officer, Accountant, Clerk, Superintendent, Foreman, and Workman of the Modern Machine Shop and Manufacturing Plant of Industrial America.

American Tool-Making and Interchangeable Manufacturing

By J. V. WOODWORTH

544 Pages. 600 Illustrations Price $4.00

A practical treatise on the Art of American Tool Making and System of Interchangeable Manufacturing as carried on to-day in the United States. It describes and illustrates all of the different types and classes of small Tools, Fixtures, Devices and Special Appliances which are in general use in all machine manufacturing and metal-working establishments where economy, capacity, and interchangeability in the production of machined metal parts are imperative. It is a practical book by an American Toolmaker, written in a manner never before attempted, giving the 20th century manufacturing methods and assisting in reducing the expense and increasing the output and the income.

Gas Engines and Producer-Gas Plants

By R. E. MATHOT

320 Pages Fully Illustrated Price $2.50

A practical treatise setting forth the principles of Gas Engines and Producer Design, the Selection and Installation of an Engine, Conditions of Perfect Operation, Producer Gas Engines and their Possibilities. The Care of Gas Engines and Producer-Gas Plants, with a Chapter on Volatile Hydrocarbon and Oil Engines. Thoroughly up-to-date in its treatment of the subject, the work discusses at considerable length the generation of producer-gas and its utilization in gas engines. No other book in English presents anything like as full a discussion of this most important phase of the gas engine. Indeed, no other book devotes even a chapter to producer gas, despite the fact that it is the coming fuel for gas engines of high power.

☞ *Any of these books sent prepaid on receipt of price.*

☞ *A special circular of these books will be sent to anyone on application.*

MUNN & COMPANY

Publishers of Scientific American

361 Broadway New York

The GREATEST "small" Comforts in Traveling

LITHOLIN WATERPROOFED LINEN COLLARS and CUFFS

They cut down baggage and expense, and keep one always looking neat with fine linen, without laundering. When soiled, they wipe perfectly clean and white as new, with a damp cloth. Being linen, they look it. Not celluloid or rubber. Never wilt, crack or fray. In all the latest styles.

Collars 25c. Cuffs 50c.

If not at your dealer's, send, giving styles, size, number wanted, with remittance, and we will mail, postpaid. Booklet of styles free on request.

THE FIBERLOID CO., Dept. 22, 7 Waverly Place, N.Y.

WATERPROOFED LINEN
STYLE ECONOMY **LITHOLIN** FIT COMFORT
COLLARS & CUFFS

BIG GAME RIFLE

FOR SALE.—One Double-Barreled Rifle, made to order by one of the best German rifle makers. Finest workmanship. Anson-Deley, Greener system. Pistol stock. Sights righted to 300 and 500 feet. Takes a shell 2¾ inches long, and a steel-jacketed bullet of 1 ounce. Powder charge 54 grains (nitrocellulose). Caliber 0.43 inch. Also 140 cartridges, 250 caps, and 75 bullets. Regular price $450. Will sell for $250. Also 1 telescopic sight (Hensoldt) $16; 1 telescopic sight (Busch) $15; 1 used telescopic sight (Scopar) $16.
THIEM, 248 79th Street, Brooklyn, N. Y.

LET US BE YOUR FACTORY
STAMPINGS, MODELS, EXPERT WORK
THE GLOBE MACHINE AND STAMPING CO.
970 Hamilton St., Cleveland, O.

ICE MACHINES Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery.
E. V. BAILLARD. 24 Frankfort Street. New York.

RUBBER Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO., 228-229 South Street, New York

Experimental & Model Work
Cir. & advice free. Wm. Gardam & Son. 221 Fulton St, N.Y

ELECTRIC GOODS.—Big Cat. 3 cts. Want Agents. Ohio Electric Works, Cleveland, O.

HEADQUARTERS FOR
DIES TOOLS SPECIAL MACHINERY & MODEL WORK
If made in metal, we make it
NATIONAL STAMPING & ELECTRIC WORKS
153-159 S. Jefferson Street, Chicago

HOEFT & COMPANY Die Makers, Machinists and Machinery Builders
CHICAGO, U. S. A.

MODELS & EXPERIMENTAL WORK, Gears, Dies, Tools, Novelties manufact'd.
M. P. SCHELL, 1759 Union Street, San Francisco

MODELS & GEARS INVENTIONS PERFECTED UNION MODEL WORKS 193 So. CLARK St. CHICAGO.

DRYING MACHINES For all kinds of granular materials. S. E. Worrell, Hannibal, Mo.

TELESCOPES SEND FOR CATALOGUE
W. & D. MOGEY.
BAYONNE CITY, N.J.

Telegraphy Circular free. Wonderful automatic teacher. 5 styles $2 up. OMNIGRAPH CO., Dept. 52, 39 Cortlandt St., New York.

Mated pair kissing.—From eggs to squab sin 4 weeks.

Write to-day for our 1908 **FREE** Squab Book, How to make money breeding Squabs
PLYMOUTH ROCK SQUAB CO, 361 Howard St, Melrose, Mass

CEMENT BOOKS. How to Use Portland Cement 50c.; Cement Sidewalk Construction, 50c.; Reinforced Concrete Construction, $2.50; Hollow Concrete Block Building Construction, 50c. Sent postpaid.
CEMENT AND ENGINEERING NEWS, Chicago, Ill.

Rose Polytechnic Institute
A College of Engineering. Mechanical, Electrical and Civil Engineering, Chemistry and Architecture. Extensive shops and laboratories. 25th year. Expenses low. For catalogue and professional register of Alumni, address C. L. Mees, President, Terre Haute, Ind.

How to Build a 5 H.P. Gas Engine at Home

In SCIENTIFIC AMERICAN SUPPLEMENTS 1641 and 1642, E. F. Lake describes simply and thoroughly how a five horse power gas engine can be built at home. Complete working drawings are published, with exact dimensions of each part. Price by mail for the two Supplements, 20 cents.

Order from your newsdealer or from
MUNN & COMPANY
Publishers
361 Broadway, New York

DESIGNS.

Badge, A. L. Williams	39,393
Button, D. T. Klein	39,394
Button, W. J. Wolff	39,395
Candelabrum, P. R. Zinser	39,404
Chair, F. Augusteen	39,409
Dish, P. R. Zinser	39,401
Glass jar, C. S. Whipple	39,403
Glass vessel, J. C. Haley	39,402
Globe for pendant lights, E. O. Cross	39,405
Harmonica, M. Hohner	39,410
Lamp, gas, A. Rector	39,406
Scarf pin or similar article, H. J. Lichtenberger	39,396
Slipper, F. Ostrowsky	39,412
Spoons, forks, and similar articles, handle for, G. P. Ittig	39,397
Spoons, forks, or similar articles, handle for, Perry & Fulcher	39,398
Towel pin, Nelson & Barber	39,408
Tumbler, J. C. Haley	39,399
Tumbler, P. Ebeling	39,400
Type, font of, W. A. Schraubstadter	39,411

TRADE MARKS.

Abrasive material, certain, Matchless Metal Polish Co.	69,831
Ale, ginger, Red Rock Spring Water Co.	69,820
Automobiles, V. Bendix	69,827
Belting, leather, Laminated Belting Co.	69,830
Boiler injectors and boiler feeders, steam, Nathan Manufacturing Co.	69,774
Books, toy, Reilly & Britton Co.	69,835
Boots and shoes, leather, Haynes Henson Shoe Co.	69,810
Candy, Walter M. Lowney Co.	69,794
Canned fish, Getz Bros. & Co.	69,770
Canned fruits, Griffith-Durney Co.	69,771
Canned fruits and vegetables, Griffith-Durney Co.	69,772
Canned salmon, North Pacific Trading & Packing Co.	69,775
Canned salmon, Yakutat & Southern Railway Co.	69,839
Canned vegetables, Illinois Selling Co., 69,773, 69,786,	69,787
Cartons and boxes, G. Franke	69,829
Chemicals, certain, J. L. & D. S. Riker	69,815
Cigar and cigarette holders and tobacco pipes, S. M. Frank	69,761
Coils, reactance, F. Meyer & Co.	69,832
Corsets, J. Margaine-Lacroix	69,818
Electric light carbons, H. Reisinger	69,836
Electrical apparatus, certain, Ruthardt & Co.	69,837
Embroidering hoops, Crown Co.	69,802
Fertilizers, Virginia-Carolina Chemical Company	69,764
Fire extinguishing apparatus, chemical, American-La France Fire Engine Co.	69,796
Fireworks, hand, E. H. Wagner	69,765
Flour, wheat, Moseley & Motley Milling Co., 69,791,	69,792
Foods, certain, Home & Colonial Stores	69,812
Glass and metal polish, Kaolo Manufacturing Co.	69,789
Glucose, Corn Products Manufacturing Co.	69,782
Gum, chewing, Doniphan & Co.	69,769
Hams, R. B. Wildman	69,795
Headache powders and liver pills, Joseph S. De Loste Manufacturing Chemical Co.	69,816
Hoes, Norvell-Shapleigh Hardware Co.	69,776
Knit silk underwear, Julius Kayser & Co.	69,817
Knives, razors, scissors, shears, and nail files, F. Westpfal	69,824
Krausen apparatus, Charles Zoller Co.	69,800
Laces, shoe, German Artistic Weaving Co.	69,807
Lamp burners, Wheeling Stamping Co.	69,838
Laxative, Gum-Lax Manufacturing Co.	69,808
Lemonade, seltzer water, and fruit juices, Deutsche Si'-Si' Werke mit beschrankter Haftung	69,805
Liniment, rheumatism, C. A. Heft	69,811
Linoleum, H. V. Brown	69,760
Lumber, logs, timber, and staves, A. Cousseire	69,768
Macaroni, Pfaffmann Egg Noodle Co.	69,777
Machinery and parts thereof, certain, Detroit Lubricator Co.	69,785
Matches, Strohmeyer & Arpe Co.	69,763
Medicinal preparations, E. M. Shipman	69,822
Oils and greases, certain, A. Sommer	69,780
Padlocks, Eagle Lock Co.	69,828
Paints, McClintock & Irvine Co.	69,790
Paints, certain, Atlas Preservative Co.	69,767
Paper, building, McClintock & Irvine Co.	69,762
Paper, news print, Watab Pulp & Paper Co.	69,781
Pork and beans, Joseph Campbell Co.	69,788
Printing machines and parts thereof, International Multigraph Co.	69,813
Printing plates, machinery for finishing stereotype, Campbell Printing Press & Manufacturing Co.	69,799
Pumps and pumping machinery, American Steam Pump Co.	69,797
Purgative elixir, compound, Hanrahan Pharmacal Co.	69,809
Radiators, sheet metal, Pressed Radiator Co.	69,834
Remedies for nervous debility, Interstate Remedy Co.	69,814
Remedy for certain diseases, J. S. Robinson	69,821
Remedy for rheumatism and gout, Warner Drug Co.	69,823
Ribbons, W. Sarasin & Co.	69,825
Rubber buckets, National India Rubber Co.	69,833
Rubber water bottles, C. J. Bailey	69,826
Shirts, collars, and cuffs, Earl & Wilson	69,806
Shirts, negligee, L. B. Clawson	69,801
Skirts, dress, J. B. Mally	69,819
Spices, J. J. Schotten	69,793
Sugar, grape and corn, Corn Products Manufacturing Co.	69,783
Sugar tablets, S. S. Pierce Co. 69,778,	69,779
Syrup, glucose, stock food, and grape sugar, corn, Corn Products Refining Co.	69,784
Toilet preparations and medicines, certain, Barclay & Barclay	69,798
Toilet preparations, certain, Zona Toilet Co.	69,840
Veterinary worm powders, C. F. Cutler	69,803
Watches and clocks, Western Clock Mfg. Co.	69,766
Wines, certain, P. Dempsey & Co.	69,804

LABELS.

"Brockhaus-Tea (Galeopsis Grandiflora)," for an herb tea, H. J. Friesenhahn	14,277
"Cottage," for coffee, Woolson Spice Co.	14,275
"Munsell's Mica," for mica, E. Munsell & Co.	14,279
"Nita Allen," for cigars, C. B. Henschel Mfg. Co.	14,274
"One-at-Night Tablets," for a medicine for constipation, liver trouble, and biliousness, P. C. Reed	14,278
"Parmer's Diamond P," for coffee, F. D. Parmer Co.	14,276
"Three Cigar," for cigars, C. B. Henschel Mfg. Co.	14,273

PRINTS.

"Pedology or the Science of Foot Reading," for a corn and bunion remedy, C. Woofter	2,319

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

An Intercommunicating Telephone System

brings the most extensive plant into a compact, united organization. Such a system works great economy of time by giving instant communication between all parts of the plant, and by permitting the users to remain at their posts instead of personally visiting the various departments. By making verification of instructions easy, Intercommunicating Telephones save many expensive mistakes and misunderstandings. Western Electric Telephone Apparatus is standard; large production makes it low in first cost, and high quality makes it low in maintenance cost.

DYNAMOS-MOTORS WESTERN ELECTRIC COMPANY CABLE-TELEPHONES-SUPPLIES

Write for our Bulletins on Intercommunicating Telephone Systems for Business and Residence Use

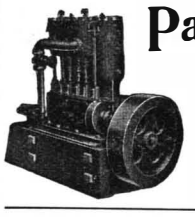
WESTERN ELECTRIC COMPANY
263 S. Clinton Street, Dept. 519, Chicago
467 West Street, Dept. 519, New York

CURTISS WORLD'S RECORD MOTORCYCLES

New Single and Double Cylinder Models for 1908 now ready. Diamond Medal, Highest Award, National Endurance run, won on a Curtiss. Send for Catalogue H and Booklet "Achievements."

G. H. CURTISS MFG. CO., Hammondsport, N. Y.

Palmer Motors



Two and Four Cycle. One, Two and Four Cylinder. Stationary and Marine. One to Twenty H.P. Catalogue FREE.

PALMER BROS., Cos Cob, Conn.
New York: 30 East 20th Street
Philadelphia: The Bourse
Boston: 85 Union Street
Portland, Me.: Portland Pier
Seattle, Wash.: Colman Dock
Vancouver, B. C.: 1600 Powell St.

A MONEY MAKER
Hollow Concrete Building Blocks Best, Fastest, Simplest, Cheapest Machine. Fully guaranteed.
THE PETTYJOHN CO.
615 N. 6th Street, Terre Haute, Ind.

Do Your Own Printing

$5 press prints cards, labels, etc. Circular, book, newspaper press $18. Money saver, maker. All easy. Rules sent. Write factory for press catalog, type, paper, etc.
THE PRESS CO., Meriden, Conn.

Science for the Evenings

The Heavens Without a Telescope

A MOVING PICTURE OF THE UNIVERSE

The Only Combination Sun, Moon, Star and Planet Map

Every Stellar body accurately placed for any date for the next twenty years, in the Northern Hemisphere. Indorsed by leading scientists. Requires no technical knowledge to use it. Complete mastery of the heavenly bodies in a few hours.

Most graphic way of interesting all in the wonderful planetary system of the Universe. Chart is 15 inches square, with revolving disk map showing all stars. Made of heavy cardboard.

Special Offer. For a limited time only, we offer our readers this splendid Planisphere at a special reduced price of $3.00, postpaid. Send for descriptive circular.

MUNN & COMPANY, 361 Broadway, New York

DON'T BUY GASOLINE ENGINES UNTIL YOU INVESTIGATE "THE MASTER WORKMAN," a two-cylinder gasoline, kerosene or alcohol engine, superior to any one-cylinder engine; revolutionizing power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Less to Buy—Less to Run. Quickly, easily started. Vibration practically overcome. Cheaply mounted on any wagon. It is a combination portable, stationary or traction engine. SEND FOR CATALOGUE. THE TEMPLE PUMP CO., Mfrs., Meagher and 15th Sts., Chicago. THIS IS OUR FIFTY-FIFTH YEAR.

Garden Hose

Rubber Belting

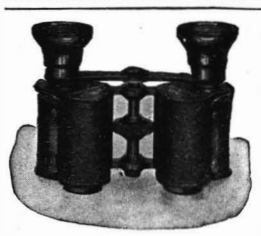
Steam Packing

Rubber Specialties

N. Y. BELTING & PACKING CO.
LIMITED
91 and 93 Chambers Street
NEW YORK
WRITE FOR CATALOGUE

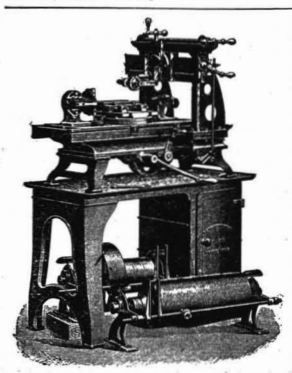
DECARBONIZER

chemically removes carbon from cylinders, piston rings and valves.
INCREASES POWER 20 PER CENT
Volatilizes carbon, in which form it passes out thru exhaust. **Injury to metal impossible.** Agents wanted in certain localities. **Sample, quart can, $1.50.** Write to-day for particulars.
General Accumulator & Battery Co
128 Second Street, Milwaukee, Wis.



GOERZ
BINOCULAR
"PAGOR"

The smallest and newest PRISM GLASS made. Has not its Equal. Possesses extraordinary sharpness and clearness.
Descriptive catalogue sent on request.
C. P. GOERZ AMERICAN OPTICAL CO.
52 Union Square, E., New York
CHICAGO, ILL. 1514 Heyworth Building
SAN FRANCISCO, CAL. 703 Claus Spreckels Building



Improved Power or Hand Planer

for the model maker, experimenter, or amateur. Its features are the Double Lifting Screws and the simple manner of changing from power to the Hand Crank. Workmanship guaranteed throughout. List price complete $155. Parts interchangeable.
A. J. Wilkinson & Co., Machinery, 184-188 Washington St., Boston, Mass

Tools! Tools! Tools!

We keep all kinds. Send your name on a postal and get our 88-page Booklet
Montgomery & Co., 109 Fulton St., New York City

LUFKIN
TAPES AND RULES
ARE THE BEST.
For sale everywhere. Send for Catalog No. 16.
LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.

60 YEARS' EXPERIENCE

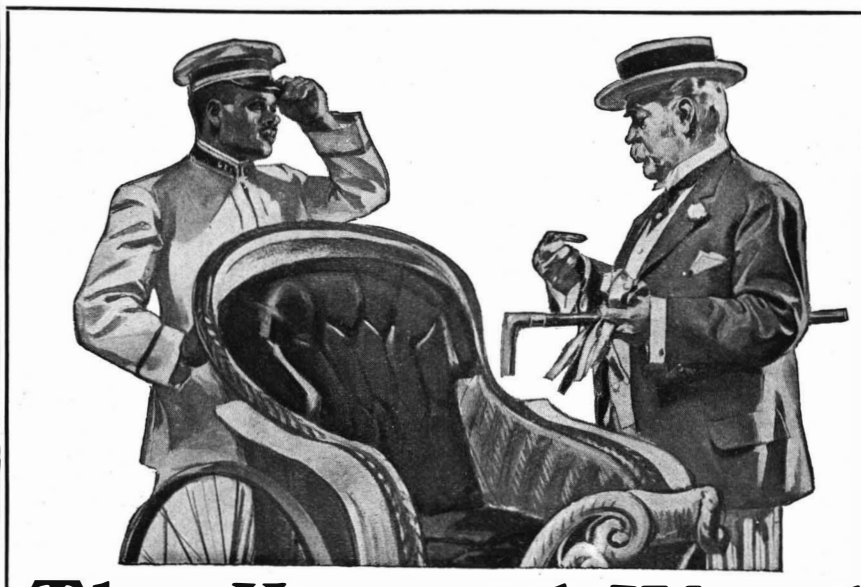
PATENTS

TRADE MARKS
DESIGNS
COPYRIGHTS &c.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. **HANDBOOK** on Patents sent free. Oldest agency for securing patents.
Patents taken through Munn & Co. receive *special notice*, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.
MUNN & Co. 361 Broadway, **New York**
Branch Office, 625 F St., Washington, D. C.



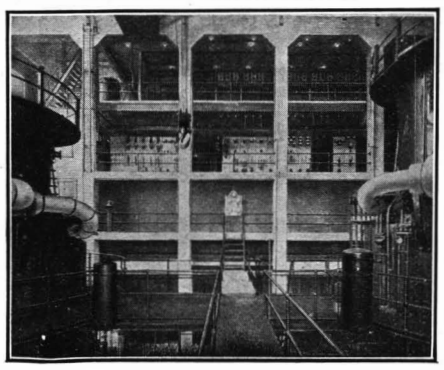
The Howard Watch

"Whether working or recreating I am lost without my HOWARD watch," says a prominent Mining Engineer. "It is my time authority on everything from a Railroad to a roller chair."
Think of the technical men, the experts in all lines, who rely upon the HOWARD. The great achievements of the day are timed by it—from the big ditch of Panama to Peary's Arctic Expeditions. It is the watch of the men who do things.
The HOWARD probably does not weigh as much as the watch you now have in your pocket, or take up as much room. It is compact, workmanlike, finished.
The HOWARD is always worth what you pay for it. The price of each watch—from the 17-jewel in a fine gold-filled case (guaranteed for 25 years) at $35; to the 23-jewel in a 14K solid gold case at $150—is fixed at the factory, and a printed ticket attached.
It will pay you to find the HOWARD jeweler in your locality. He is a good man to know.

Elbert Hubbard visited the home of the HOWARD Watch and wrote a book about it. If you'd like to read this little journey drop us a postal card—Dept. P—we'll be glad to send it to you. Also a little catalogue and price list, with illustrations actual size—of great value to the watch buyer.

E. HOWARD WATCH COMPANY, Boston, Mass.

Interior View of Georgetown Power Station of the Seattle Electric Company

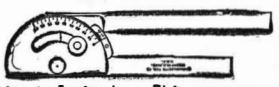


POWER STATION

This power station was designed by us and built under our supervision.
Our Engineering Department is prepared to figure out every detail of your power requirements, to draw up complete plans and to select and purchase complete equipment.
Our Construction Department contains masters in every branch of construction work.
We turn the plant over to you ready to operate.
Our contracts are on a basis of cost plus a fixed sum, or cost plus a percentage. We therefore act as agents for our client, keep him fully informed as to progress, costs, etc., and submit vouchers for all expenditures.
If you contemplate any work of this nature write for our booklets.

STONE & WEBSTER ENGINEERING CORPORATION
CONSTRUCTING ENGINEERS
147 Milk Street, - - - Boston, Mass.
We are prepared to design and construct water power developments, power stations, industrial buildings, railways, electrical transmission lines and distributing systems, either new work or extensions. Correspondence invited.

Draughtsman's Protractor



This is a great tool for any draughtsman. It is instantly adjustable to any angle, and has a vernier reading to 5 minutes. It is so arranged that all parts are flush on the under side. Finished in dull nickel. Will be sent to any address, charges paid, for $3.80.
GOODELL-PRATT CO., Greenfield, Mass.

Everything for the Automobile

SUPPLIES AND PARTS AT LOWEST PRICES
Our 1908 Catalog just out—200 pages, 1,000 illustrations, 5,000 descriptive prices **Sent Free**
NEUSTADT AUTOMOBILE AND SUPPLY COMPANY
3932 Olive Street, St. Louis, Mo.

"IF IT'S WIRELESS WE MAKE IT."

The Collins Wireless Telephone Co.,

(A. FREDERICK COLLINS, Technical Director)

Makers of **THE COLLINS LONG DISTANCE WIRELESS TELEPHONE** and Manufacturers of **WIRELESS TELEPHONE and TELEGRAPH APPARATUS OF EVERY DESCRIPTION.** Induction Coils, Transformers, Keys, Tuning Coils, Condensers, Detectors, Relays, Resistances, etc. Complete sets for any distance. Send for illustrated list.

COLLINS WIRELESS TELEPHONE CO.
Offices and Laboratory
54-56 CLINTON STREET, NEWARK, NEW JERSEY, U. S. A.

ORDNANCE EXPERTS

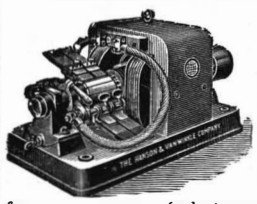
Send for full information about the new
1908 Model Lewis Depression Position Finder
Address **CHARLES M. DALLY, Ordnance Specialist, 29 Broadway, New York, U. S. A.**
Cable Address CHASDALLY, NEW YORK

Engineering News

(ILLUSTRATED)
214 Broadway, New York
The leading weekly Engineering paper of the world, devoted to the interests of Civil, Mechanical, Mining, and Electrical Engineers. 100 to 125 pages weekly. Send for free sample copy.

COLD GALVANIZING

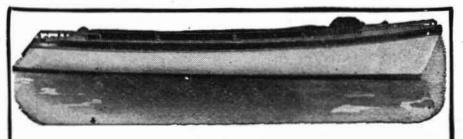
IMPORTANT PATENT DECISION



An important decision has just been rendered by Judge Cross of the Circuit Court of the United States, District of New Jersey, in favor of the Hanson & Van Winkle Co., of Newark, N. J., and Chicago, Ill., and against the United States Electro-Galvanizing Company, of Brooklyn, New York, for a new process of electro-galvanizing.

IN EQUITY ON FINAL HEARING

The Hanson & Van Winkle Co. took up this fight single handed some six years ago, and have conducted it at great expense, feeling confident of final success.
This seems a particularly opportune time to call the attention of all those interested in galvanizing processes to the perfection to which the Hanson & Van Winkle Company has brought this art and to the fact that their salts and processes have now been authoritatively declared to be free and clear of infringement on this patent, which had heretofore been asserted to be all-controlling. **Whatever may be said of its validity as against others,** as against the salts and processes of this company the patent is of no effect.
While the process of the Hanson & Van Winkle Company, as installed by their experts, is simple and inexpensive, their intention is to install at once in the larger cities, outfits in connection with their improved mechanical devices in order to show prospective users the advantage of their methods.



PIERCE MOTOR BOATS
$150.00 and up
MOTORS
$37.50 and up

Send stamps for catalog.
Satisfaction guaranteed or money refunded.
PIERCE ENGINE CO., West Street, Racine, Wis.
1421 Michigan Avenue, Chicago
Siegel-Cooper, New York City Butler Motor Car Co., Boston

ROTHWEILER

THE WRENCH WITH A GRIP

Something new at last in wrenches—
The Rothweiler is vastly different from the old style pipe wrench—
And as much superior as it is different—
It is lighter—
More powerful—
Has fewer parts—
Will give better service—
And will last longer than any other pipe wrench on the market—
Made of the finest quality tool steel—
Eight sizes—
Household size $2.00, express prepaid.

Write to-day for Illustrated Booklet

Crescent Forgings Company
1203 Railroad St., Oakmont, Pa.

THE BEST LIGHT

Brighter than electricity or acetylene --cheaper than kerosene--makes and burns its own gas.
No GREASE, DIRT, SMOKE or ODOR.
A safe, powerful, white, steady light --durable and handsome. Over 100 styles--every lamp warranted.
AGENTS WANTED EVERYWHERE.
THE BEST LIGHT CO., 87 E. 5th St., Canton, O.
Owners of Original Patents.

MEDAL OF HIGHEST AWARD
JAMESTOWN EXPOSITION

Add TONE to your Stationery in the OFFICE, BANK, SCHOOL or HOME by using only Washburne's Pat.
"O.K." PAPER FASTENERS
There is genuine pleasure in their use as well as Perfect Security. Easily put on or taken off with the thumb and finger. Can be used repeatedly and *"they always work."* Made of brass, 3 sizes, in brass of 100 fasteners each. Send 10c for sample box of 50, assorted. Booklet free.
THE O.K. MFG. CO. Dept. X **Syracuse, N.Y.** No 18